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EDITORIAL NOTES

GAS LIGHTING RESEARCH

"THE gas burner and the gas mantle are two very important features of every-day life which have received rather less than their due share of scientific attention in the past. Like the wheel and the decimal point they have been taken for granted by the people who have had to use them." There is much truth in these opening sentences of a Paper given last week to the Illuminating Engineering Society by Messrs. Minchin, Densham, and Wright, of the Gas Light and Coke Company. We publish in to-day's "JOURNAL" an abstract of the Paper, and we know that its implications will excite interest. As cold text the Paper is worthy of more than passing attention. At the meeting in question it was accompanied by a series of demonstrations cleverly designed and excellently expounded. These demonstrations, which we were privileged to see, made a complex problem appear simple while yet revealing further complexities and further possibilities.

There is no doubt about it that gas lighting has received less than its due share of attention. As the Authors observed, for the last forty years all gas lighting has had as its basis the light giving powers of a mixture of thoria and ceria when heated in a gas flame. The last decade of the nineteenth century saw the introduction of the Welsbach mantle. Naturally this light giving device was eagerly seized upon by the Gas Industry, for it represented such a remarkable improvement upon the flat flame burner. To gas lighting it brought a new lease of life—a lease, by the way, which has not by any means expired. The invention was accepted with enthusiasm; but with any invention is mere acceptance enough? Shapes of mantle, types of weave, and design of burner have changed during the present century, but to what degree have the fundamental principles of gas lighting been considered? The fact is that the Gas Industry has been content largely to sit back in contentment and regard with pride Welsbach's great achievement without, however, questioning possible developments of gaseous combustion as light-emitting energy. In relation to such developments Gas Industry research has been negligible. Isolated efforts by research workers unconnected with the Industry have been made; it is to be doubted whether the results of these efforts—some more successful than others—have been studied and the possibilities of the work at all appreciated. Certainly there has been no organized research financed with an eye to the future, by which we mean long-term research.

The reasons why approximately 99% of thoria mixed with 1% ceria, with the addition of traces of a number of other substances for strengthening purposes, is the mixture employed for impregnating mantle fabric were elucidated by the Authors; and it would seem that there is little prospect of finding a better mixture than the one already in general use. Gas lighting, as understood and practised, is a thermal effect. Developments recently made in gas burners are likely to result, through higher aeration and consequently higher flame temperature, in increased gas lighting efficiency, but on the purely thermal radiation theory of gas lighting there appears little prospect of ever increasing efficiency by more than, say, 100%—an amount which would still leave the energy efficiency exceedingly low. The present figure for a low-pressure lamp is about 0·2%. But must reliance be placed solely on thermal radiation? In 1842, as the Authors mentioned in the Paper, Balmain, who prepared boron nitride, discovered that it showed an "elegant green phosphorescence" in the outside fringe of a flame. At the meeting of the Illuminating Engineering Society they repeated the experiment, showing how, with a specimen treated with boron nitride, the greenish-blue glow starts first as the specimen heats up. When it has become quite bright the red of normal incandescence begins to show itself, and only when the substance has reached a bright red heat is the green colour masked. This luminescence, it would seem then, is not a thermal effect, but a chemical phenomenon. Investigators have recorded as high a value as 40% for the chemi-luminescence resulting from the union of sodium and iodine under special conditions.

We commenced this short note by quoting the opening sentences of the Paper by Messrs. Minchin, Densham, and Wright. We end it by quoting their final sentence: "Once . . . the phenomenon of the incandescent mantle is established as being of the nature of luminescent the barriers are down, and there is no longer any theoretical reason why lighting efficiency should not be advanced ten or a hundred fold." Is gas lighting research worth while?

ROAD TAR IN WARTIME

EARLY in the year we remarked that one result of the war might well be a keener appreciation by highway authorities of tar for the maintenance and construction of roads, apart from special uses—such, for example, as camouflaging and aerodrome repair—imposed or likely to be imposed as a result of wartime conditions and needs. We pointed to the need for prudent and well-directed expenditure on highways, to the need for giving attention to the preservation of existing roads and cheap forms of surfacing for the construction of new roads. Early in the year, too, we expressed satisfaction that the British Road Tar Association was continuing with vigour its highly valuable work not only in making the merits of road tar more generally known but in developing preparation and application technique. In last week's "JOURNAL" we gave a brief account of the speeches at a wartime luncheon (in substitution of a peacetime dinner) of the Association of Tar Distillers. On that occasion Mr. Robert Bernays, M.P., Parliamentary Secretary to the Ministry of Transport, made this significant observation: "Tar has always been regarded as a most valuable material in road construction. Happily it is a 100% British product. It is very desirable that highway authorities should make a point of using tar and its associated products wherever it is possible. The work of British scientists in the field of tar is well known. There is no better evidence of their success than the position which British tar holds all over the civilized world."

In September last a wave of severe depression arose in highway circles; it was, in fact, mooted in many quarters that a policy of *laissez-faire*, a policy of standstill, was inevitable. Fortunately this tide of gloom and extreme pessimism has given way to a brighter—though, of course, a wartime—outlook and a more constructive one. It has been brought home that at any rate maintenance of our roads must, in the interests of safety and economy, be carried on; and we think that the prospects for road tar in this direction are very much brighter than they were eight months ago. Business may perhaps be slow and uncertain in the field of new construction—though we have reason to know that "new construction" should be interpreted in a wide sense—but in the sphere of maintenance there is an immense field for British road tar now and in the coming months. By "road tar" we mean tar properly prepared and properly applied. As for the sphere of action, in 1939 there were 190,000 miles of highway in this country.

It seems to us that there is plenty of good work to be done. Let us make sure, however, that the work, when carried out, *is* good. The reputation of tar has steadily risen since the last war, largely, as we have suggested many times, through the continued efforts of the British Road Tar Association—due to agreed adherence to standards and, as we have said, to better

application of the right material on the road. This is a time surely when many who hitherto have been reluctant to turn to tar as a road material, perhaps as the result of some unfortunate experience in the past—a personal experience or, maybe, the hearing of a colleague's experience—will come to use it. If the high standard to which we have referred and which has been built up only as the result of many years' work is kept up at the present juncture and during the coming months, we feel sure that the expression of opinion on the part of new users of tar will be favourable and that they will, after the war, have no inclination to revert to an imported material for road construction and maintenance. With one further proviso—that there is also "service after sales." There must throughout the British tar industry be the appropriate method of approach, an understanding of the problems involved, and a preparedness and readiness to help in technical matters. As in the marketing of coke, this implies close and universal co-operation within the industry, which is in a perfectly sound position to "deliver the goods" and gain and retain the confidence of the highway authorities and their responsible officials.

How to Get Steel

If there were any steel users who still thought that they could order and expect early delivery as if nothing had happened, they were disillusioned by the review of the steel control situation which we gave in the "JOURNAL" last week. There would probably have been less need for such enlightenment if "Memorandum 3" had been more widely circulated when the steel distribution scheme was introduced. We confess that we had not seen the Memorandum—a 16-page booklet for the information of customers issued by the Iron and Steel Control—when we wrote our comments last week. By the time we obtained a copy from Steel House, Tothill Street, London, S.W.1, we had, more or less, familiarized ourselves with the operation of the scheme, and could find in it little, if anything, to add to our earlier references to the Gas Industry's steel supplies, but it would be most helpful if every maker of gas plant and appliances were placed in possession of a copy of the booklet, which clarifies a good deal of what is obscure in the official Control Orders. It is a pity it cannot be obtained from the Stationery Office, or, apparently, from anywhere in the provinces. We are assured, however, that copies can be obtained on application, preferably personal, at Steel House.

Electricity's Domestic Market

Interest attaches to the statement in the *B.E.A.M.A. Journal* that contrary to general expectations the domestic market has not stagnated. Demand, it is remarked, continues to be active, more particularly for room heating, cooking, and water heating. Commenting on this the *Electrical Review* pointed out that it is essential that domestic development should be maintained, because of its importance not only to electricity supply but also to electrical manufacture. "Despite the depressing effects of the wartime regulations, of retrenchment and shortage of materials, the load building effort cannot be relaxed." The same line of argument applies to the Gas Industry, which, too, cannot allow the domestic market to stagnate, because of its importance not only to gas supply but also to the manufacturers of gas appliances.

The W.G.C. Forges Ahead

It is gratifying to see that war conditions have proved no deterrent to progress of the Women's Gas Council. Indeed, it has provided an opportunity for demonstrating the true value of the Council as an organization for nation-wide social service. The "high light" of last week's Fifth Annual General Meeting—which is referred to on later pages of this issue—was perhaps, the presentation to the Y.M.C.A. for service with H.M. Forces of a mobile canteen which has been subscribed for by all branches of the Council. This "corporate gift to the Nation" was formally handed over at the meeting by Lady Milne-Watson, Vice-President of the W.G.C. and Hon. Treasurer of the Canteen Fund, and general pleasure was expressed at the compactness and serviceability of the unit. It is understood that the canteen is to be put into commission immediately and will fulfil a very valuable function as part of the Y.M.C.A.'s great work among the Forces both at home and overseas.

The extent of the Council's annual report testifies to the continued and increasing usefulness of the organization—particularly at this time, when members who had drawn together in friendship and understanding at social meetings during peace now find even greater need for co-operative and organized effort in the cause of national service. Many branches have taken up first aid, nursing, and canteen work, either as a whole or among individual groups of members. Others have formed themselves into knitting and needlework parties and have "adopted" ships, R.A.F. units, or local men serving with the Forces. In every branch the members have found out what work is urgently required in the district and have organized themselves to do it. Miss K. M. Halpin, the energetic Organizing Secretary, has set an example in the work she is doing at the Headquarters of the W.V.S., while her assistant, Miss A. M. S. Wilson, is indefatigable in her efforts to carry on the activities of the W.G.C. to full effect. Even during the discouraging conditions of the last twelve months a number of new branches have been formed. In fact, the whole tenor of the W.G.C. report goes to show that the organization forms a unit of the Gas Industry of which it has every cause to be proud, and which is working wholeheartedly to strengthen and build on the foundations which have been so well and truly laid.

Greater Scope for the Gas Poker

The Gas Industry has never doubted the value of the gas poker—both as a useful load and as a labour-saving adjunct to the household services. At this time, however, the humble and prosaic gas poker assumes an importance which is at least implicit if not actually stated in authoritative pronouncements on the subject of waste and salvage generally. The old-fashioned method of lighting solid-fuel fires with wood and paper uses materials of which there is a serious shortage at the present time. By utilizing a gas poker to light the fire we are burning a home-produced fuel which releases valuable by-products vital to the prosecution of the war, while we are at the same time preserving our "waste" paper for salvage purposes and our wood for still more valuable applications.

Here, then, is a great opportunity for the Gas Industry to fulfil one more national service—and a forceful argument to back its efforts. Under the heading of "Gas Poker Alternative," a *Daily Telegraph* reporter, writing last week on the subject of salvage, brought the matter into prominence by saying: "This raises the question whether in wartime it would not be wise to encourage the lighting of fires by gas pokers, using home-produced fuel, rather than by paper which must be imported." This has set the ball rolling. It rests with the Gas Industry to follow it up by all the means in its power.

Forthcoming Engagements

May

3.—North of England Association.—Annual Meeting, County Hotel, Newcastle, 2 p.m. Luncheon, 12.45 p.m.

6.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.

7.—N.G.C.—Central Executive Board, 2.30 p.m.

7.—I.G.E.—Council, 10 a.m.

8.—I.G.E.—Library Committee, 11 a.m.

9.—Federation of Gas Employers.—Annual Meeting of Members in Scotland, North British Station Hotel, Edinburgh, 11.30 a.m.

9.—N.G.C.—Annual Meeting of Members in Scotland, North British Station Hotel, Edinburgh, 2.30 p.m.

18.—Scottish Western Juniors.—Address by N. G. MacGregor, on "Education."

22.—Southern Association.—Eastern District Meeting, Gas Industry House, 2.30 p.m.

23.—Eastern Counties Association.—Spring Meeting at Norwich. Paper by W. T. Hallam (Bedford) and Works visit.

23.—Wales and Mon. Association.—Annual Meeting at Porthcawl.

25.—Manchester and District Juniors.—Meeting at Stockport. Paper by J. B. Walsh, "Co-ordination of High and Low Pressure Gas Supplies."

25.—Yorkshire Junior Association.—Meeting and Paper by A. E. Wilson (Huddersfield), "Town Gas in Foundry Practice."

June.

4 & 5.—I.G.E.—77th Annual General Meeting in London.

5.—N.G.C.—Annual General Meeting, May Fair Hotel, Berkeley Street, W.1, 2.30 p.m.

5.—S.B.G.I.—Annual Meeting, Grosvenor Hotel, Victoria, S.W.1, 2.30 p.m.

28.—Waverley Association.—General Meeting, North British Hotel, Edinburgh.

Letters to the Editor

Multi-point Water Heating

SIR,—The letter over the signature "Ewart & Son, Ltd., Established 1834," in your issue of April 24, which is a reply to my letter published in the "JOURNAL" of Feb. 14, compels me now to make the following statement which I purposely refrained from making in my earlier letter.

It was in 1930 that I introduced and first started making the gas water heater in this country—the heater which is now known as the "Ascot" throughout the length and breadth of the land. I recall with satisfaction taking the first models of the appliance to leaders in the Gas Industry to explain to them the details of it, and to demonstrate its operation. After careful study of the appliance, the view was expressed that it was revolutionary in design and novel in construction, and it was the kind of appliance which the Gas Industry had long been seeking. It was also said that it would cause some makers of geysers to look to their laurels, and it was believed that it would stimulate them to endeavour to get out of the rut of conventional and traditional designs and constructions which had, up to that time, characterized gas water heaters.

These views, expressed ten years ago, have proved to be correct. I am more than happy to have rendered a service to the Gas Industry, and I regard, with the pioneer's pardonable pride, the achievements so far obtained. There are other aspects of this matter I could refer to at length, but I do not propose to do so, nor do I think it necessary to enlarge upon them, as I am sure they are generally understood and appreciated by gas engineers.

Yours, &c.,
B. FRIEDMAN.

244, High Holborn, W.C. 1.
April 26, 1940.

Severe Weather and Instantaneous Water Heaters

SIR,—Although gas-heated water appliances, like cookers, are much less seasonal in their sales than was formerly the case, yet the early spring and summer does see a larger proportion installed than, for instance, the winter. As their use, however, is nowadays continued throughout the year the effect of cold weather on performance and maintenance is of great importance, whereas this aspect of the matter may possibly recede into the background in proportion as the winter season is remote at the time the sale is effected.

Fortunately, if I may use the word with a meaning restricted to the subject in hand, we have just passed through the severest winter on record since gas water heating appliances came into general use, and some of its effects are important to those sections of the Industry concerned.

The most striking of these is the effect of ice formation. The large instantaneous water heater with finned tubes and water operated gas-valve, which was introduced into this country in quantity some 10 or 12 years ago, had been mainly developed, and in particular by German enterprise, on the continent of Europe, where the winters are much more severe than with us, and it is therefore a curious thing that such heaters should have suffered from this effect. I think the reason must be sought in the fact that in those colder countries two factors were at work to disguise the trouble now disclosed. These are the one, specific—viz., the use of more substantial building design such as wall and roof thickness combined with good pipe protection—and the other, general—viz., the much more universal flat system where central heating in normal times prevents frost from becoming a menace.

I write "normal times" because, if we are to believe the reports in the daily Press, this last winter in Germany has not been normal, and many buildings have apparently been without fuel for heating. It would be interesting and apropos to learn whether the effects found in this country were duplicated in Germany.

What were these effects? Briefly stated the ordinary instantaneous heater or geyser with broken feed and concentric annular waterways could be frozen solid without any immediate after effects. The expansion of the water during freezing, which, by the way, is more than is generally realized, could apparently be accommodated either into air spaces above or by bulging the walls, without fracture or puncture.

The finned tube type did not give any particular trouble with its *waterways* either because the pilot light was left burning and provided sufficient heat in the coil to prevent the formation of ice, or, since some heaters *must* have been left without pilot lights and since no particular complaints have been recorded, because the expansion was taken up in a similar manner to that in the annular geysers.

When we come to the automatic water-actuated gas-valve, however, a very different story must be told. Great numbers of these valves were completely wrecked, irrespective of whether the pilot jet was alight or not. The pilot is invariably *above* the valve work and therefore without practical effect in preventing freezing. The valve itself is located in most cases *horizontally* below the burner, and, as those interested will remember, there is a diaphragm housing completely filled with water. When no water is flowing through the heater the action of a spring closes a gas-valve, outside the housing, and by means of a rod connexion simultaneously pushes the diaphragm towards one wall of the housing. When water is flowing, water pressure is directed against this side of the diaphragm, and, often assisted by venturi suction on the other side of it, the diaphragm is forced across the housing and, transmitting its motion by means of the rod, opens the gas-valve. Such horizontally located diaphragm housings were, as already indicated, wrecked on freezing because there was no accommodation for the volume increase due to the formation of ice.

The only bright spot in this story is that some heaters of the finned tube type are provided with vertically located diaphragm housings, and so far as can be ascertained none of these, including our own Main M.1 and D.1. models, suffered any damage. In the territory of one undertaking some of these latter were due for inspection, but in the case of five of them the inspection had to be postponed because they were apparently frozen solid. Subsequently they were found to be working normally. The reason for this immunity of the vertically located diaphragm appears to be that the housing retains some air in the spaces and so long as the space thus free of water is greater than the increase of volume of the water on freezing, so long will the effect be confined to compressing this air.

ARTHUR FORSHAW,
Chief Chemist.

Main Water Heaters, Ltd.,
48, Grosvenor Gardens, S.W.1.
April 26, 1940.

The Theory of Ice Formation

SIR,—Perhaps, owing to the severity of this winter's frost, and to the many burst water pipes due to ice formation, I have made bold to challenge the truth of the generally accepted theory on the principles of ice formation.

So deep-rooted and universal do I find the belief in these principles that in conversation, daring to ventilate my renegade views, I have met eminent engineers, and even found students fresh from their university, imbued with the age-old formulæ.

One engineer referred me to "Hope's Experiment," as though it were the last word on the subject.

Hope's Experiment, I found to my utter amazement, dealt only with the changing density of cooling water (a reversal of density taking place at 4° C.), there being no evidence whatsoever that Hope ever produced ice formation in his experiment.

Yet, the general belief was, and is, "that as the temperature of the water approaches freezing point, the density of water changes, the coldest water becomes the lightest, and is sent by kind Nature to the surface to freeze, hence ice always forms on the surface first, and thus does Nature preserve the fish in our ponds and lakes."

As one example, I reasoned that if immediately before freezing cold water ascended, then we should get no burst water pipes, because the warmer water would descend to the domestic service pipes and the colder water ascend to the cold water tank to freeze, whereas the opposite happens and it is the pipes that freeze. However, finding no converts, I decided to search for demonstrative evidence, and in my efforts I was courteously assisted by the Laboratory of Messrs. Walls, of Acton, and herewith I furnish incontrovertible proof of my contentions.

Experiment 1.—I repeated Hope's Experiment, and extended it to the sphere of ice formation, but using the modern and colder snow-ice as the freezing medium. The water behaved exactly as described in Hope's Experiment, but the ice formed as an annulus on the interior of the receptacle, immediately adjacent to the freezing medium, there being at no time any ice at or near the surface of the water, or in the receptacle below the level of the freezing medium.

Experiment 2.—A glass of water, standing on a block of snow-ice. The temperature of the water slowly fell to 4° C. Then ice commenced to form on the *bottom* of the glass, and grew upwardly, and finally after several hours, stability was established with ice 1½ in. thick on the bottom of the glass, with 1½ in. of water at 4° C. above the ice, and with no sign of ice at any moment at or near the surface.

Experiment 3.—A glass, partially filled with water, standing on a wooden table, and surmounted with a block of snow-ice. The water slowly cooled to 4° C., and then ice formed on the

surface of the water, and gradually grew downwardly to 1½ in. thick, and after several hours stability for the particular conditions set in, there being no ice at any time towards the bottom of the glass.

Experiment 4.—A receptacle, the shape of a gasholder tank, filled with water and snow-ice applied externally to one-third of the circumference (representative of an icy-cold wind blowing on a holder). The water slowly cooled as before, when ice formed on the interior of the tank wall, immediately adjacent to the freezing medium, the ice extending for the full depth of the tank, but no ice was ever in evidence on the surface of the water, and this after many hours.

Therefore, these experiments prove conclusively that as the water cools it becomes heavier and sinks to the bottom, its place being taken by warmer and lighter water. But this circulation stops as the temperature reaches 4° C. (all as per Hope's Experiment), after which relative stagnation sets in, as Nature prepares for her metamorphosis of water into ice, and the ice forms in *any portion* of the stagnant water where there exists a sufficiency of cold, quantitatively, to extract the relatively enormous quantity of latent heat necessary for the conversion of water into ice.

Yours, &c.,

H. J. TOOGOOD.

43, Uxbridge Road,
Hampton.
April 24, 1940.

Personal

Presentation to Mr. C. F. Botley

Maidstone was the scene last Thursday of a very happy function when some 35 officials of South-Eastern Gas Corporation undertakings gathered to show their esteem of Mr. C. F. Botley—lately retired after nearly 50 years' continuous service at Hastings and St. Leonards. Others were unable to be present, but all the same it was a representative party, and admirable arrangements had been made by Mr. G. le B. Diamond (Folkestone) and Mr. F. A. Gulland (Maidstone).

At a luncheon the chair was taken by Mr. C. Valon Bennett (Rochester), now the doyen of the Corporation's station engineers, who succeeded in expressing exactly the affection and esteem in which Mr. Botley is held not only by those who have been more immediately his colleagues, but throughout the whole Gas Industry. "We are met," said Mr. Bennett, "not to say goodbye to our guest, but rather to tell him how well we think of him, and to wish him great happiness in the many years which we hope lie before him." Apart from the great work which Mr. Botley had done for Hastings, his labours in connexion with effluents, naphthalene, and tariffs would never be forgotten; nor was it always remembered that it was he who, as President, steered the Institution through the stormy days of the general strike and the coal strike of 1926. In conclusion, Mr. Bennett asked Mr. Botley to accept, from all subscribers present and absent, the gift of a fitted travelling case (Mr. Botley's own choice)—a token of their sincere appreciation of him as "a great engineer, a loved colleague, and, above all, a man with a great heart."

Obituary

E.W.L.N.—An Appreciation

With the sudden passing of Mr. E. W. L. Nicol, who died on Monday, April 22, the cause of gas coke has lost a pioneer and staunch advocate.

Born at Arbroath, in the county of Angus, Mr. Nicol had many of the qualities of the traditional Scot. He combined in his work a steadfastness and determination (amounting one might almost say to dourness) with a genial manner and "pawky" humour which endeared him to his many friends both in and outside the Gas Industry.

Trained as a Marine Engineer it was not until 1913, when he was appointed Engineer and Fuel Expert to the London Coke Committee, that Mr. Nicol took an active interest in gas coke. At that time coke was generally considered more of a liability than an asset to the Gas Industry. All the coke was then sold in fierce competition with cheap coal for steam raising, and it was largely left to the newly appointed engineer to improve existing utilization of coke and to develop new and more suitable markets. Turning first to the use of coke for steam raising, Mr. Nicol soon developed the Sandwich system of fuel blending, a system which will always be associated with his name. Writing of the system in his book, "Coke and Its Uses," Mr. Nicol says: "Coke being free from hydrogen burns without the formation of water. This fact, and the reduction of the volatile matter in the combined fuel to a minimum, constitutes an important element in obtaining and maintaining smokeless combustion and a high thermal efficiency." The principle is here clearly recognized of the high radiant heat transfer obtainable with coke; a principle which is being increasingly applied in the design of modern coke appliances.

In the domestic field much of the pioneer work of Mr. Nicol and the London Coke Committee has been forgotten in the rapid advances which have been made in recent years. One of the first domestic appliances developed was the flat topped open fronted coke boiler which combined in one appliance a means of obtaining a constant supply of hot water with occasional space heating by high-temperature radiation. This development has been of far reaching importance to the Gas Industry, since it led to the replacement of the kitchener by a coke boiler and a gas cooker thus opening up markets for the two complimentary and smokeless fuels—gas and coke. As befits a pioneer, Mr. Nicol was always turning over in his mind means for improving the utilization of coke, and concrete evidence of his inventive ability will be found in the "Neocoke" boiler and the "Neocoke" stove. The N.C. coke grate patented in 1920 has not proved so popular an appliance, but its appearance did direct attention to the use of coke for domestic space heating at a time when practically no coke was sold for this purpose.

In conclusion, I should like to record a remark which appears to me typical of Mr. Nicol, the man and the crusader in the cause of gas coke. We were laboriously mounting the stairs of a large office building to investigate the operation of several coke fires when he suddenly stopped and said, "My boy we have to show these people how to use coke; remember that whatever coal can do coke can do better—and it's smokeless." I commend this fighting spirit of E.W.L.N. to all connected with the sale of coke.

F. J. E.

* * *

Mr. THOMAS BROWN, of West Bank, Ashover, died on April 22, aged 80. Before his retirement some five years ago, he had been Engineer and Manager of the Matlock and District Gas Company, from 1891 to 1935. He was one of the founders of the Hathersage Gas Company, of which he had been a Director for 34 years and Chairman for over 12 years.

* * *

The funeral of the late Mr. TIMOTHY DUXBURY, whose death was recorded in last week's "JOURNAL," took place at Union Street Congregational Church, Oldham, on April 22. Besides the private mourners, the President of The Institution of Gas Engineers (Mr. George Dixon) was represented by Mr. Greenhalgh, Gas Engineer at Oldham, who, together with the Commercial Manager, Mr. E. Parry, represented Oldham Gas Department. Mr. T. Reynolds (President), Mr. H. Burton (Hon. Secretary), and many members, were present on behalf of the Manchester Association, and Mr. H. Platt (President) and Mr. F. Johnston (Hon. Secretary) on behalf of the Manchester Juniors. Col. W. M. Carr, O.B.E., represented the United Kingdom Gas Corporation, and, with many others present, the Northern Star Lodge.

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Alderman J. W. GREENWOOD, Chairman of the Stalybridge Gas Committee for the past seventeen years, died suddenly on Monday evening after being taken ill at a gas-works meeting.

* * *

News has reached Falkirk that Sergeant Pilot NEIL R. DAVIDSON has been killed on Active Service. He was only 19½ years of age and entered the service of the Falkirk Gas Department on the technical side just two years ago.

S.B.G.I. Silver Medal Awards

The Council of the Society of British Gas Industries have again this year awarded a Silver Medal to each of the Junior Gas Associations for the paper adjudged to have been the best presented during the year by a member at a General Meeting. Fourteen papers—all of a high standard—were submitted by eight Associations, and a list of the awards is given below:

London and Southern District.—L. F. Randall (South Metropolitan), "The Servicing of Gas Apparatus."

Manchester and District.—Edmund Bates (Manchester), "Operation of Intermittent Vertical Chamber Ovens."

Midland.—F. N. Tidball (Coventry), "Structural Principles in Design of a Waterless Gasholder."

Scottish (Western District).—D. Beavis (Helensburgh), "The Modern Domestic Field."

Scottish (Eastern District).—R. Cowie (Hawick), "Sales."

Wales and Monmouthshire.—K. E. Muir (Cardiff), "Testing Modern Gas Appliances."

Western.—F. A. Rhead (Exeter), "Some Technical Problems at Exeter Gas-Works."

Yorkshire.—Dr. H. A. Fells (Sheffield), "Metallurgical Smoke Abatement."

News of the Week

The Sales and Publicity Section of the Glasgow Corporation Gas Department has been transferred to the Central Showrooms, 522, Sauchiehall Street, Glasgow ('phone: Douglas 2296-7). The staff transferred includes Mr. A. Bujnowski (Sales and Publicity Officer) and Mr. Russell (New Building Representative).

Plans Have Been Passed by Bairds & Scottish Steel, Ltd., for the construction at the Gartsherrie Ironworks, Coatbridge, at a cost estimated at approximately £300,000, of a complete by-product coking plant, including gasholders.

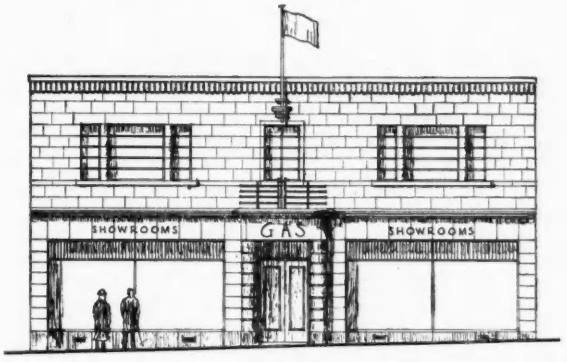
The Committee Which Has Been Set Up by the Secretary for Mines to consider and report on the best means of encouraging and developing the use of home produced fuels in internal combustion engines under war conditions, has already been in touch with a number of representative organizations and has received evidence from them. Before completing its report, the Committee wishes to be satisfied that all bodies or individuals who have views on this subject have had an opportunity of submitting them. Consideration will, therefore, be given to any further correspondence or evidence provided that it is forwarded not later than May 10 to the Joint Secretaries, Committee on Home-Produced Fuels for Internal Combustion Engines, Metropole Buildings, Northumberland Avenue, W.C.2.

Owing to the Possible Effect on the interests of any of the 24 subsidiary companies concerned, the House of Lords is to give special consideration to the Bill promoted by the South Eastern Gas Corporation. The Bill seeks to secure additional powers for its subsidiaries without its being necessary for each company to present a separate bill. This is a new departure, involving the principle that similar legislation might be promoted by any parent or holding company controlling a bare majority interest. Another clause of the Bill would alter the voting rights of shareholders in the subsidiaries so that the large shareholders would be much more favourably treated than in the scale of voting laid down by the Companies Clauses Act, which would be superseded.

New Showrooms at Leven

The new offices and showrooms of the Buckhaven and Leven Gas Commissioners in North Street, Leven, are now nearing completion. Estimated to cost approximately £4,000, the new premises are artistically designed, and form a handsome addition to the already many attractive shop fronts in Leven.

The illustration gives an impression of the front elevation of the building, which is a double-fronted two-storey construction having a frontage extending some 45 ft. Two large bronze-framed display windows are provided on either side of the entrance doorway. The lower portion of the new premises is fronted in dark grey granite, with black granite base. Handsome pilasters abut on either side of the entrance door.



The interior presents a spacious showroom to the front on the ground floor, with storage accommodation and cashier's counter for the payment of accounts and general enquiries behind. Additional office accommodation and Board Room occupy the floor above. In the basement the provision of air raid shelter accommodation has been made.

Mr. L. A. Rolland, L.R.I.B.A., of Leven, is the architect of the new premises, which, it is anticipated, will be ready for occupation at an early date.

Paris International Trade Fair

Undaunted by the unknown risks that lie ahead and encouraged by offers of support from all quarters, the Committee of the Foire de Paris announces its 32nd annual Paris International Trade Fair, to be held at the Porte de Versailles from May 11 to 27. The international aspect of the Fair, in which the French Gas Industry will be represented, will be developed to an even greater extent this year. Important national sections have been promised from Italy, Holland, and Spain, as well as the usual interesting displays from Switzerland and Belgium, and many manufacturers will be showing for the first time.

Visitors to the Fair from Great Britain are entitled to specially reduced travel fares, incorporating a reduction of approximately 40% on the French railways and of 33.3% on the English part of the journey. Full particulars of these facilities and of the Fair arrangements generally, may be obtained from the London Office of the Foire de Paris, 17, Tothill Street, Westminster, S.W.1.

"Gas Journal" Directory

In order that readers may be able to keep the particulars contained in the "JOURNAL" Directory up to date, we summarize in the following list various changes of which we have been advised during the past month:

Page 18. COLCHESTER. M. Smith appointed E. & M.
„ 30. GREAT YARMOUTH. P. D. Walmsley, E. & M.D., deceased.
„ 50. NEWHAVEN. R. Woodward appointed E., M., & S.
„ 82. BURNTISLAND. D. Marshall appointed E. & M. *vice* W. Brown retired.
„ 96. FERMOY. M. J. Treacy, M., resigned.
„ 98. QUEENSTOWN. M. J. Treacy appointed M., *vice* W. E. Young, retired.

We are advised that the undernoted gas companies now have their registered offices at 50, Cannon Street, E.C.4. (Secretary, A. E. Scott):

Brackley Gas Company, Ltd. (page 10).
Brixham Gas and Electricity Company (page 12).
Crediton Gas Company (page 20).

Institute of Fuel Awards

For Papers on Fuel Technology

The Institution of Gas Engineers has pleasure in announcing that the Council of the Institute of Fuel, to encourage the preparation of papers by students of Fuel Technology, have decided to make an annual award of a Medal, together with a prize consisting of books and/or instruments to the value of £5.

The Rules governing the award of this prize and Medal can be obtained on application to the Secretary of The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1.

South-Eastern Gas Corporation, Ltd.

The Directors of South-Eastern Gas Corporation, Ltd., announce that, after transferring the sum of £10,000 to general reserve, they are recommending the payment of a final dividend on the ordinary shares of 2½% actual (less tax), making, with the interim dividend already paid, a dividend of 5½% (less tax) for the year ended March 31, 1940, on the ordinary shares ranking for dividend for the full year (last year 6%, less tax).

They also announce that the net revenue for the year available for the payment of ordinary dividends on the increased capital was £97,540 (last year £107,468).

The General Meeting will be held on May 8, 1940.

Associated Gas and Water Undertakings, Ltd.

The Directors of Associated Gas and Water Undertakings, Ltd., announce that they are recommending at the forthcoming Annual General Meeting a final dividend on the ordinary shares of 2½% actual (6d. per share), less income-tax at 7s. 6d. in the £, making with the interim dividend already paid, 5% actual, less tax, for the year ended March 31, 1940. (Same.)

They also announce that net profits for the year amount to £74,574 (against £75,150 last year).

PHYSICAL PROBLEMS ASSOCIATED WITH GAS LIGHTING

By
L. T. MINCHIN, B.Sc., A. B. DENSHAM, M.A., and J. WRIGHT, B.Sc.

Abstracted From a Paper to the Illuminating Engineering Society, April 23.

During the past eighteen months a systematic research has been in progress at Watson House to determine the way in which the entrained air is influenced by the dimensions of the burner. Although this work is still far from completion some of the results which have already been established may be of interest.

Effect of Burner Shape

At the entry into the burner is a gas jet which supplies the motive power for the air flow in which we are interested. The jet consists of a tube which is narrowed down to a small circular orifice, and the angle which the sides of this approach make with the axis was one of the first factors to be considered. Elementary considerations of stream-lining suggest that the form of a perforated flat disc which is often employed in practice must give rise to wasteful eddies, and a tapered approach should be better. On the other hand, if the taper were too gradual there would be a rise in friction with the sides since the channel would then become, in effect, a very long one. This analysis of the situation is confirmed by the experimental results shown in Fig. 1, from which it appears that the maximum air-entraining power is obtained when the approach is in the form of a 55° cone.

The momentum of the air-gas mixture when the air-entraining process has come to a stop must still be sufficient to force it through the flame ports. Actually the resistance does not lie solely in the flame ports themselves, but also in

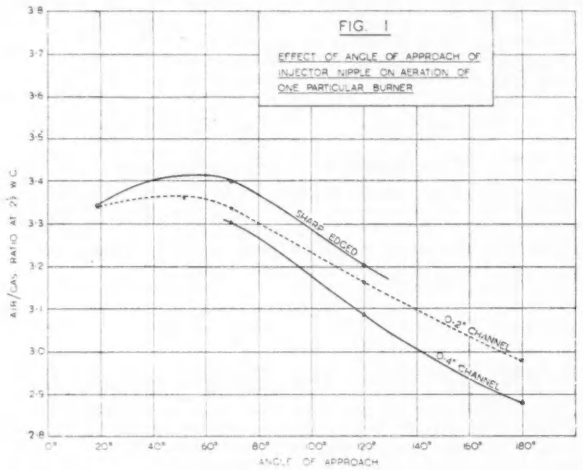


FIG. 1
EFFECT OF ANGLE OF APPROACH OF INJECTOR NIPPLE ON AERATION OF ONE PARTICULAR BURNER
AIR/GAS RATIO AT 2½ W.G.
SHARP EDGED
0·2" CHANNEL
0·4" CHANNEL
ANGLE OF APPROACH

the burner throat, tube, and bend, although the flame ports are usually the dominant factor. This is shown in Fig. 2. If the flame port area is increased from zero the aeration mounts rapidly at first, irrespective of the other resistances, in an approximately straight line. Ultimately a point is reached at which other resistances begin to play a part, and then further increases in the flame port area have less and less effect. Naturally, this flattening out of the curve takes place soonest when the resistance of the burner tube is highest in relation to the gas rate, and on the four curves shown in Fig. 2 the appropriate values of throat area per cubic foot of gas per hour have been indicated.

Maintenance of a Stable Flame

The velocity of the flame is normally a maximum when the air-gas ratio is somewhat below that required for complete one-stage combustion. For most town gas this ratio has the value of about 4.3 and the maximum flame velocity occurs at about 3.7. Below about 1.7 the flame velocity is zero.

If the aeration increase is obtained by enlarging the area of the flame ports—as in Fig. 2—the velocity of efflux will fall

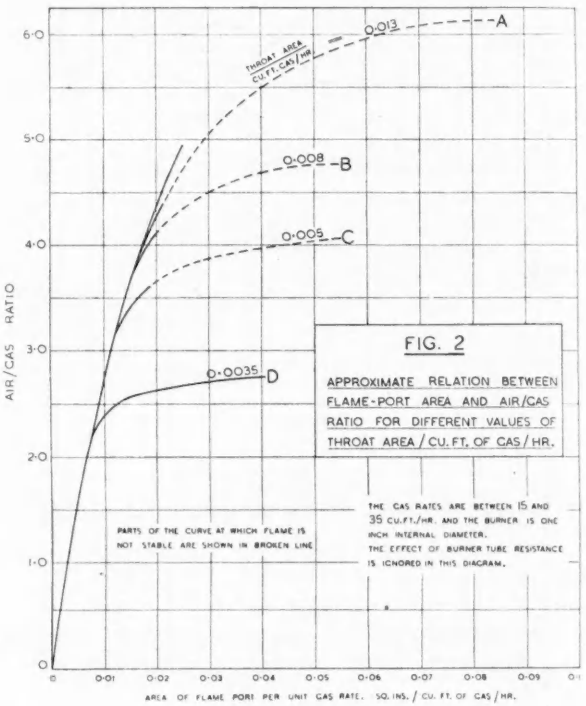


FIG. 2
APPROXIMATE RELATION BETWEEN FLAME-PORT AREA AND AIR/GAS RATIO FOR DIFFERENT VALUES OF THROAT AREA / CU. FT. OF GAS / HR.
THROAT AREA CU.FT. GAS / HR.
0·013 A
0·008 B
0·005 C
0·0035 D
PARTS OF THE CURVE AT WHICH FLAME IS NOT STABLE ARE SHOWN IN BROKEN LINE
THE GAS RATES ARE BETWEEN 15 AND 35 CU.FT./HR. AND THE BURNER IS ONE INCH INTERNAL DIAMETER.
THE EFFECT OF BURNER TUBE RESISTANCE IS IGNORED IN THIS DIAGRAM.
AIR/GAS RATIO
AREA OF FLAME PORT PER UNIT GAS RATE. SQ. INS. / CU. FT. OF GAS / HR.

at the same time as the flame velocity rises, and a point will soon be reached at which the cone is too short to be stable. This point is represented by the transition from full line to broken line on the upper curves of Fig. 2. Unless a special flameproof burner head is employed the flame will not be stable in the regions represented by the broken line.

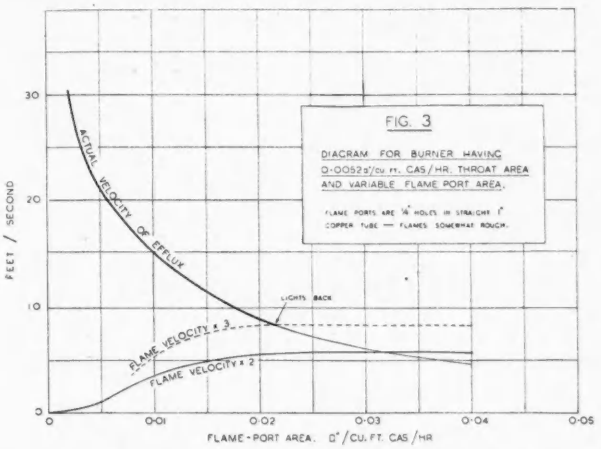
Instability usually occurs when the flame velocity is only about one-third or one-half of the efflux velocity. The actual velocity of flame propagation is about twice the fundamental speed of the flame front and therefore approximately equal to the critical efflux velocity of the burner. The disparity between velocity of flame and the velocity of efflux is still further enhanced if the flow is rough and turbulent, giving rise to severe local variations in the speed of the mixture.

In Fig. 3 the velocity of efflux and the flame velocity have been calculated from curve C of Fig. 2 and from an experimental flame velocity curve. It will be seen that the lighting-back point in this case corresponds to a value of about three times the flame velocity. Had the flame ports been more carefully streamlined it would no doubt have been possible to have reached a lower figure—say, about twice the flame velocity.

Haber has stated that the thickness of the surface of the inner cone in which primary combustion takes place is only a fraction of a millimetre; and the gases pass right through it in a thousandth of a second. In that short space of time all the hydrocarbons are destroyed and the space immediately above contains only CO, CO_2, H_2O, H_2, and N_2. The cone

surface has a high electrical conductivity, due to the intense ionisation there.

There has been much speculation as to the cause of the characteristic shape of the bunsen cone. A number of



workers have derived it by compounding velocities and drawing an envelope of the resultants. This gives a good picture of the sides of the cone—indeed the angle of the sides has been used for measuring the flame velocity—but does not explain the exact shape of the apex or the periphery. Most of these attempts have been based on the assumption that the issuing gas at the flame ports is in pure stream-line flow, but Benton has pointed out that this is not always the case, and Khitrin has attempted to allow for the change in velocity distribution resulting from the gases leaving the nozzle. It is not difficult, in any case, to arrive at a shape for the inner cone, which approximates to that observed in practice. In the simple case of a burner having uniform velocity across the flame port, the mechanism must be somewhat as in Fig. 4. A hemispherical flame front spreading out from an ignition point P (on the dividing line between burnt and unburnt gases) is swept up to a point P_1 by the motion of the gas while the flame front is expanding from P_1 to Q_1. By the time P_1 has reached P_2 the flame front has reached Q_2. Evidently this provides the basis for the formation of a cone of flame with sides parallel to the line PQ_2. It is not so clear, however, how the flame travels downwards to establish the base of the cone—*i.e.*, towards P_0; probably this takes place through the zone of hot gases surrounding the inner cone and moving much more slowly. This is consistent with the well-known fact that when the outer mantle is absent—*i.e.*, when the gas is completely burnt in the inner cone—there is a marked tendency for the cone to "blow off" the burner nozzle. This phenomenon is clearly connected with the difficulty of propagating downwards through the flame—*i.e.* in the direction of Q_2—P_0 on the diagram—and is commonly overcome by the use of the "flame-retaining ring," which is a device which provides a small region of low efflux velocity round the periphery of the flame port.

Flame-Proof Burner Head

Burners can be made to operate at high aeration and low efflux velocities if flame-proof burner heads are used. There has lately been an increased interest in the possibility of using perforated metal plates in this way, and a recent investigation at these laboratories established the relation of hole size and distance apart to "flame proofness" in such circumstances.

The resistance to flame is a result of the subdivision to which the flame front is subjected by the perforations. If this results in the diameter of the unit flame being brought sufficiently low, the heat losses become very high in relation to the heat available from combustion, and the flame cannot maintain itself.

If a flame is produced on such a plate as this at a high aeration, it forms a fine blue mat over the metal, which on closer examination is seen to consist of a larger number of small blue cones with practically no outer flame mantle. The flame is very much scattered, and although very promising for some purposes, does not seem at present very suitable for use with a gas mantle as a source of light.

It is possible, however, that some way of using it for lighting may occur. In that case, the high aeration—7 to 1 or over can easily be obtained—should give rise to a higher flame temperature which would be expected to increase considerably the lighting efficiency attainable.

Luminosity of the Gas Mantle

For the last forty years all gas lighting has had as its basis the light giving powers of a mixture of thoria and ceria when heated in a gas flame. This was introduced by Dr. Carl Auer von Welsbach in the last decade of the nineteenth century, and was eagerly seized upon by the Gas Industry because of the great increase in the light output which it made possible. Shapes of mantle, types of weave, design of burner have changed since that time, but the composition of the mantle has not been changed in any essential. Approximately 99% of thoria mixed with 1% ceria, with the addition of traces of a number of other substances for strengthening purposes, is the mixture employed, and the necessary lightness of structure is obtained by impregnating a woven organic fabric with the soluble salts and then burning away of the original fabric. What remains is a skeleton having the same microstructure as the original fabric but consisting solely of the sintered oxides.

The question "Why should this particular combination emit more light than any other?" does not seem to have greatly worried the inventor, though Simonini [1] has stated that Auer's staff were divided on this issue. The two explanations in vogue were:

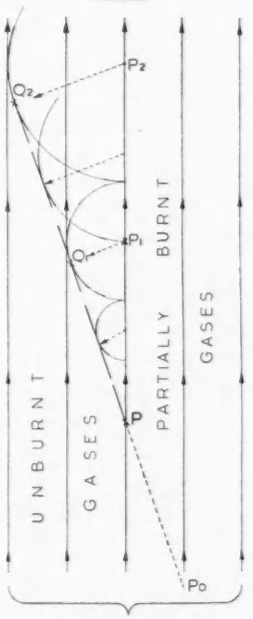
(a) chemi-luminescence resulting from rapid alternate oxidation and reduction by the flame gases. (Both cerium and thorium can form lower oxides);

(b) a "kind of phosphorescence";

while yet a third view was that the luminosity was due to catalytic combustion on the surface of the mantle, producing thereby intense local heating.

However, little systematic work was done to test these theories, and the investigation of Le Chatelier and

FIG. 4



Bondouard [2], followed by the classic experiments of H. Rubens [3], cleared the ground and seemed to establish a simple thermal explanation for the phenomenon.

The luminosity of the Auer mixture was entirely due, they said, to selective radiation characteristics. It combined a very low overall emissivity—due to the thoria—with a very high emission in the blue region of the visible spectrum and a moderate emission at the red end—due to ceria. The low

overall emissivity caused the mantle to reach a high temperature, while the emission in the visible range ensured that the colour of the light should be much whiter than the black body at the same temperature.

Reduction in the ceria content below normal causes the emissivity to fall, and although the temperature increases in consequence the luminosity decreases. On the other hand, a rise in ceria content, although it causes an increase in the emissivity, causes a fall in temperature which more than counterbalances the first effect, and the net result is again a loss in light output.

Some twelve years later this explanation was confirmed by a paper written by Ives, Kingsbury, and Karrer [11], in the course of which a very full investigation of the radiation characteristics of different refractory oxides was described. From this it was concluded that there was little prospect of finding a better mixture than the one already in general use. Thoria had a much lower emissivity than any other oxide, and the radiation characteristics of ceria were greatly superior to any of the alternative "colourants" examined.

Unusual Features of Radiation from Mantle

The radiation characteristics of the Auer mixture change with temperature and with the position it occupies in the flame. The first of these statements follows, indeed, from the fact that when cold it is white, whereas, when hot, it has a much higher emissivity in the blue than at the red end of the spectrum. Actually, the yellow colour of the mantle when hot can often be detected visually if a mantle is suddenly taken out of a flame. The "spider," a point at which the mantle is tied together, may then be seen to be yellow in colour for a moment.

The effect of a reducing flame seems to be to convert the mantle virtually into a "grey" body and thereby the temperature is lowered and the luminosity greatly diminished. This is normally ascribed to the formation of a sub-oxide of cerium—possibly Ce^4O^7—and Ives [11] claims to have obtained a grey specimen by heating a ceria-rich mantle in a reducing atmosphere and then cooling it in the same gases to prevent reoxidation.

The inner cone of a bunsen flame is, of course, a reducing region, and it is familiar to all workers with gas light that if the inner cone projects through the mantle it causes the fabric to become relatively non-luminous. The rapidity with which the glow of an ordinary mantle will fluctuate as the flame impinging upon it varies from oxidizing to reducing is greater than one would have expected from a change in chemical composition, but it is difficult to test such an hypothesis practically.

Excitation of Luminescence by Flame [1]

Of recent years the problem of the glowing of a gas mantle has become less simple because of the realization that in some cases it is possible for undoubted luminescence to be excited by contact with flame. Thus, when Balmain, in 1842 [5], first prepared boron nitride he discovered that it showed an "elegant green phosphorescence" in the outside fringe of a flame. If the experiment is repeated to-day one observes that the greenish-blue glow starts first as the specimen heats up. When it has become quite bright the red of normal incandescence begins to show itself, and only when the substance has reached a bright red heat is the green colour masked. It is claimed by Nichols and his collaborators that such a luminescence persists above red heat in some substances. Zinc oxide at 800° C. is said, for example, to glow 115 times as brightly if in contact with flame than if heated electrically. Although Nichols never claimed that the glowing of the gas mantle was an example of the same phenomenon, the parallelism is often striking. Niobium oxide, for instance, lumineses green in the oxidizing flame but radiates in a reducing flame as a black body. Again, this "cando-luminescence," as it is called by Nichols, normally occurs not in pure substances but in substances which have been "activated" by the addition of a small amount of a second substance.

Theory of "Cando-Luminescence"

So far this is a matter of conjecture only, since no one has yet put forward any theory which is adequately supported by experimental evidence.

Paneth [6] and Tiede [7] both discuss the question, considering the alternative theories of

(a) excitation by ultra-violet emission from the flames;

(b) excitation by ions contained in the flame gases;

while Goodeve [8] suggests that atoms and free radicals present in the flame are enabled to combine and give up their excess energy by the presence of the solid, this energy being emitted as light radiation.

According to this explanation, when two molecules A, B, (for example, O_2, H_2) react in a flame they momentarily form a complex containing all the energy of reaction.

$$A + B \rightarrow AB^*$$

This activated complex persists for an appreciable, though, of course, very minute, period of time, owing to certain difficulties in getting rid of the excess energy. It could radiate the energy, but this necessitates a relatively slow internal rearrangement. More usually it hands on the energy to another molecule, but this cannot occur unless the other molecule is in a suitable internal condition to receive it at the moment of collision.

Solid surfaces, however, can take over this excess energy much more easily than gaseous molecules. Provided that the solid is a better radiator than conductor, any excess energy taken over from the activated complex will be radiated by the solid. Thus, in effect, the solid is in thermal equilibrium with the most active (*i.e.*, the hottest) particles in the flame, and the radiation will be greater than corresponds to the average temperature.

This conception is in no way contrary to the Second Law of Thermodynamics, but is analogous to other forms of chemi-luminescence, where the energy of reaction is converted directly to radiant energy and is not used to heat up a body which in turn emits purely thermal radiation.

An interesting phenomenon which supports this theory is the glowing of certain substances when exposed to active nitrogen or ozone.

Tiede and Schleede [9] point out that this only occurs in substances which also show luminescence under flame excitation, and that some substances—such as Sidot blende—which are strongly luminescent to ultra-violet light, cannot be excited either by flame or by active nitrogen. It is also known that the Auer mixture is a good catalyst for the oxidation of coal gas—better, for example, than the same two oxides mixed in any other proportion.

Whatever be the true explanation, there can be no doubt that the phenomenon opens up new vistas for gas lighting, which may, perhaps, one day lead to a great increase in lighting efficiency of gas lighting.

On the purely thermal radiation theory of gas lighting there appeared very little prospect of ever increasing efficiency more than, say, 100%—an amount which, though of course desirable, would still leave the energy efficiency deplorably low. The present figure for a low-pressure lamp is about 0.2%, whereas Evans and Polanyi [10] have recorded as high a value as 40% for the chemi-luminescence resulting from the union of sodium and iodine under special conditions.

Once, therefore, the phenomenon of the incandescent mantle is established as being of the nature of luminescence the barriers are down, and there is no longer any theoretical reason why lighting efficiency should not be advanced ten or a hundredfold.

References

(1) Simonini, Trans. Ill. Eng. Soc. (U.S.A.) (1909), 648.

(2) Le Chatelier and Boudouard, Comptes Rend. 126, 1,861 (1898).

(3) Rubens, Ann. der Physik 18, 725 (1905), and 20, 593.

(4) Minchin, Trans. Faraday Society 35, 163 (1939), and 36, 505 (1940).

(5) Balmain, Phil. Mag. 21, 270 (1842); also 22, 467; 23, 71; 24, 191; and 25, 87.

(6) Paneth and Winternitz, Ber. 51 (2), 1,728 (1918).

(7) Tiede and Buscher, Ber. 53, 2,206 (1920).

(8) Goodeve—private conversation.

(9) Tiede u. Schleede, Naturviss. 11, 765 (1923).

(10) Evans and Polyanyi, Trans. Faraday Soc. 35, 179 (1939).

(11) Ives, Kingsbury, and Karrer, J. Frank. Inst. 186, 403 (1918).

Midland Association of Gas Engineers and Managers

Annual Meeting in Birmingham

The Annual General Meeting of the Midland Association of Gas Engineers and Managers was held at the Grand Hotel, Birmingham, on Thursday, April 25, under the Presidency of Mr. G. C. PEARSON (Chief Engineer of the Birmingham Gas Department).

Prior to the meeting the usual informal luncheon was held, at which, in accordance with custom, there were no speeches. The President took the opportunity, however, of welcoming their visitors, who included Mr. G. Dixon (President of The Institution of Gas Engineers), Dr. D. W. K. Braunholtz (Secretary of the Institution), and Mr. A. T. Green (Director of Research to the British Refractories Research Association).

The minutes of the last meeting having been confirmed, the HON. SECRETARY (Mr. J. H. Wainwright, of Halesowen) announced the receipt of apologies for absence from officers of kindred associations and from members.

The 62nd Annual Report of the Committee, together with the Statement of Accounts, were taken as read and unanimously accepted.

Mr. R. S. RAMSDEN (Leamington) presented the Report of the Midland Commercial Gas Association, which was seconded by Mr. G. P. MITCHELL (Worcester) and unanimously accepted. Mr. Ramsden remarked that the majority of members of the main Association were now members also of the Commercial Association, and he urged any who were still outside the latter organization to join it.

Mr. F. C. BRIGGS (Dudley), the Chairman, reported on the work of the Midland District Education Committee during the past year, observing that the Committee had not met, but that educational matters in the district were running smoothly. The difficulties which had arisen as a result of classes starting so late were now being overcome, so that students should not suffer, while provisions had been made in the event of an air raid occurring during an examination.

Officers and Committee

The PRESIDENT stated that at the beginning of the war the Committee had decided, in view of the black-out, difficulties of travel, and other disabilities, to suspend the activities of the Association for the time being. Events, however, had not taken the course which most people expected, and as other similar organizations in different parts of the country had been resuming their activities, it was decided to hold their meeting that day. In the ordinary course of events, said Mr. Pearson, their Vice-President, Mr. C. F. W. Rendle, would have assumed the Presidency of the Association at this meeting; but he was engaged in important extension work at Redditch and did not feel in a position to take office this year. It had therefore been proposed that the present Officers and Committee remain in office for another year.

Mr. RENDLE said how grateful he felt for the modestly expressed acquiescence of the President to remain in office for a further year. After the deep concern they had all felt for Mr. Pearson in his recent serious illness it was a great relief and pleasure to see him with them again that day looking as well as he did. Mr. Rendle expressed the hope that Mr. Pearson's readiness to return to work would not prevent him taking such precautions as were necessary to ensure his complete recovery.

On the proposition of Mr. BRIGGS, seconded by Mr. T. H. POULSON (Stafford), the Officers and Committee were thereafter unanimously re-elected for the ensuing year; and it was agreed to leave the appointment of a representative of the Association on the Council of The Institution of Gas Engineers in the hands of the Committee.

The following were appointed to represent the Association on the Midland District Education Committee:

Mr. G. C. Pearson (Birmingham).	Mr. C. F. W. Rendle (Redditch).
Mr. F. C. Briggs (Dudley).	Mr. W. G. S. Cranmer (Wolverhampton).

Mr. C. Rhodes Armitage, who recently resigned the position of Engineer and Manager to the British Gas Light Company at Hull, and Mr. H. Davies, who has lately retired from the position of Engineer and Manager of the Chesterfield Corporation Gas Department, were elected Honorary Members of the Association.

Wear and Tear on Refractory Materials

A review dealing with the wear and tear on refractory materials in gas manufacture, illustrated by lantern slides and samples, was then given by Mr. A. T. GREEN, F.I.C. (Director of Research to the British Refractories Research Association), and Mr. T. F. E. RHEAD, M.Sc., F.I.C. (Chairman of the Joint Committee of the Gas Research Board and the British Refractories Research Association). A summary of the speakers' remarks will be given in a subsequent issue.

Following a short discussion, a hearty vote of thanks to the speakers was proposed by Mr. G. DIXON (Nottingham), the President of The Institution of Gas Engineers, and seconded by Mr. C. F. W. Rendle.

FEATURES OF THE PERFORMANCE OF GAS WATER HEATERS

(Concluding from page 200 of last week's "JOURNAL" our report of the discussion on Mr. J. E. Cooper's Paper to the London and Southern District Junior Gas Association on April 5.)

Open Type Heaters

Mr. **E. C. A. Bliault** (National Gas Water Heater Co., Ltd.) said he presumed Mr. Cooper's remarks regarding the possibility of varying views on the merits of open type heaters were prompted by the fact that there had been some prejudice against the so-called open type of appliance in the past. Recent designs of this type of appliance, however, must be placed in quite a different category, said Mr. Bliault, from those designed many years ago—and, especially, the old bogey about water contamination could safely be relegated to oblivion for all time. It was interesting to note that this type of heater was referred to as the nearest approach to a truly instantaneous heater, and it was a fact that this type of appliance could definitely claim to offer a higher practical efficiency than any other instantaneous or, as Mr. Bliault preferred to call them, continuous flow heater—as being more truthful. This, of course, was due to the fact that in the modern design of open type appliance there was no heated water left in the apparatus—at least, no effective quantity—after the gas was turned off; and even this small amount ran out of the heater hot. In addition to this, there was, of course, the added practical efficiency due to the fact that it was unnecessary gradually to heat a flow of water plus the contents of the coil to anything approaching the extent necessary with a coil type appliance.

On the question of overall efficiency, particularly as it affected the small sink heater, went on Mr. Bliault, his Company made some experiments some time ago, and they were amazed at the difference in overall practical efficiency between the closed type of sink heater and their own type of appliance. With draw-offs of half a gallon—which they understood to be about the average for the sink—the difference in favour of the open type approximated 25%; and he could well imagine that with the half-pint draw-offs mentioned by Mr. Cooper the favourable comparison of the open type against the closed would be astounding. Another feature which was very favourably disclosed with the open type had been the fact that during the last two very severe winters which they had experienced in this country they had had no case of damage to appliances through frost brought to their notice.

A most important feature, of course—and this would be well known to Mr. Cooper and, in fact, to all gas undertaking executives—was the cost of maintenance which gas water heaters involved. Here again, said Mr. Bliault, the open type of appliance, with its simple construction and freedom from connexions by nuts and bolts holding it together, lent itself to simple maintenance. His Company had had these heaters under observation, without any maintenance service in the case of the small heaters, for upwards of 2½ years, and in the case of the larger size of bath heater for over a year and a half, without any maintenance of

any kind whatever. These heaters had been placed, of course, in households where they had normal use with a family of three people. Mr. Bliault observed that in view of the fact that the open type heater had been expressly mentioned in the Paper, he felt that a little information culled from actual experience would prove not unhelpful, and would, he hoped, enable the Industry to realize the maintenance saving and many other advantages attributed to the open type continuous flow heater, its truly instantaneous operation, and its benefits to the consumer.

Continuing, Mr. Bliault said that he had had considerable experience of secondary gas control. His Company, which was established in this country in 1927, manufactured a larger size of heater employing a secondary gas control which controlled the temperature of the water after it had been heated and was actually leaving the appliance. These appliances were supplied in large numbers for dish-washing purposes, where the temperature was set as high as 190°—and they could make that temperature control operate so that if the temperature exceeded that figure it shut off the gas definitely and fully.

With regard to the question of corrosion, Mr. Bliault said he did not know whether it was possible to employ aluminium with the closed type of heater, but they employed it in their open type of heater, and he thought they could justly claim that a result of this, coupled with the design of the appliance, was that corrosion was almost negligible. He did not quite agree with Mr. Cooper's suggestion that the multi-point heater was more desirable than the bath heater and sink heater. He had heard it stated, however, that the latter installations were preferable by reason of the fact that they reduced the gas bill—which was the determining factor in most households.

Mr. **Cooper** agreed that the modern open type heater was vastly different from the older types, and he was interested to hear that Mr. Bliault had had no trouble during the frost. Mr. Cooper believed that the trouble was not in the interior of the heater body but in the valve itself. He emphasized that the multi-point heater could give automatic service throughout the house, and even if the gas bills were slightly higher they must realize that if people wanted service they must pay for it. In many small houses and flats the provision of two separate water heating installations was unwarranted even if practicable.

Independent Water Governors

Mr. **G. F. Jenkins** (Main Water Heaters, Ltd.) endorsed what Mr. Cooper had said with regard to the value of the life test. It prevented one from falling into the troubles which must arise from the omission of proper thinking in relation not so much to design as to the use of materials. In connexion with water governors, Mr. Cooper had mentioned a type of governor which was incorporated in the multi-point heater. His firm, on the other hand, had found it useful to provide a water governor as a separate entity. They considered that two advantages were obtained thereby. One might have two multi-point heaters in stock—one suitable for low pressures and the other for high pressures. In the latter case, where there were fluctuating pressures, one could fit a water governor as a separate part either direct on the water inlet or in any position on the water pipe, so that the consumer could obtain remote control if necessary. This was a volumetric governor combined with a temperature selector. The second advantage was that a water governor required a certain pressure to operate it—in their case 12 lb. per sq. in.—and by having it as a separate attachment, when the water pressure fluctuated it did not affect the operation of the heater as it did when it was combined with the automatic valve. The heater remained in operation until the pressure dropped to that necessary to operate the valve—namely, 4 lb. per sq. in. In conclusion, Mr. Jenkins said that they had experienced no trouble in Main heaters, through the freezing up of the automatic valve because they left sufficient space for the expansion of the water on freezing.

Mr. **J. Emmerson** (Main Water Heaters, Ltd.), in the course of a written contribution to the discussion, observed that there was something to be said for not aiming at too high an efficiency for a water heater. High efficiency was often coupled with short life and especially so with the modern finned heating unit. A design which sacrificed 2% or 3% on thermal efficiency might lead to considerable prolongation of the life of the heater and, what was more important, to a less frequent need for servicing. Low thermal efficiency, within reason, also assisted in the complete evacuation of the products of combustion. This became important when the secondary flue consisted merely of a bend, a short longitudinal duct through the wall, and a high resistance wall terminal. Under these circumstances part of the products were almost certainly spilled from the baffler, and the extra temperature assisted in reducing this spillage to a minimum. The difference in output was not regarded by most Gas Engineers as important.

On the subject of practical efficiency, went on Mr. Emmerson, it was opportune to note that the pilot, which the layman regarded as wasted on a non-storage heater, was usefully employed in keeping the heating unit and its contained water warm. This must surely have an appreciable effect on the practical efficiency. He would be interested to know if the Author had any figures to illustrate this effect. Mr. Emmerson also asked Mr. Cooper if it was his experience that the average consumer troubled to learn the art of "tap-twiddling" in order to obtain the hottest water. He had found that in many cases the consumer preferred to have the throttle set so that hot water was obtained on opening the tap fully, to be diluted with cold if necessary. This had been noticeable with the variable water governor supplied by his firm. Average consumers' practice in this respect would have a bearing upon whether 100° rise should be obtainable on an opening valve or whether it should be obtainable by opening the valve fully and then reducing the flow.

Mr. **Cooper** said that the fitting of a water governor separately was good from the point of view of the manufacturer; but if they could build such controls into the heater they had a neater and more workmanlike job. They could overcome certain difficulties due to pressure fluctuations with a well-designed built-in governor which did not put up the working pressure required to a figure not likely to be met with in normal conditions. With regard to the clearance of products when the efficiency was within the limits of the bench tests, Mr. Cooper thought they could discount the possibility of any noticeable change in the performance of the heater. They had no figures available as to the heating effect of the pilot flame. It must be remembered in this connexion that while the heater was a very good piece of mechanism for getting heat into the water, it was also a good one for drawing it out. So the net heating effect would be very small indeed. Mr. Cooper agreed that the majority of consumers did not "tap-twiddle." Moreover, if the heater was not in the same room as the tap it was impossible to know whether the gas was on or off. He was interested to hear of the Main vertical valve. He had no idea it was not full of water when the heater was off.

Need for Co-operative Research

Mr. **Leopold Friedman** (Ascot Gas Water Heaters, Ltd.) stated that failures due to the recent severe frosts generally were exceptional, and must be regarded as an inducement to study possible improvements in this respect. The freezing of "Ascot" appliances could always be quite easily prevented by carrying out the few simple instructions set out in the installation card which was supplied with every heater. He went on to say that the problem of corrosion was not peculiar to gas appliances, but covered a wide range from gas and electric heaters to motor cars. It was unfortunate that because of present day "commercialism" it appeared to be impossible to undertake co-operative research, which would be the easiest way to approach and eventually solve the problem. Mr. Friedman stated that his own firm had done a great deal of research on this subject. Unfortunately, prevailing conditions—157 of their technical personnel, including experienced research engineers were serving with His Majesty's Forces. While it was difficult to obtain certain materials for experimental purposes—had impaired this research. However, they considered themselves justified in stating that a solution was in sight.

Referring to Mr. Jenkins' statement that the advantage of an independent water governor was that should the water pressure fall below the one at which the governor came into operation, it still enabled the valve to operate, Mr. Friedman stated that it was certainly a fact that sometimes a water governor incorporated in the heater would interfere with the working of the valve, but this was not the case with the "Ascot" water governor, with which they had had six years' experience on the district. The following table showed that the "Ascot" water governor, which was incorporated in the valve, for all settings of the temperature control, came into operation at a higher head than that required to open the gas valve fully. This was purely a matter of design.

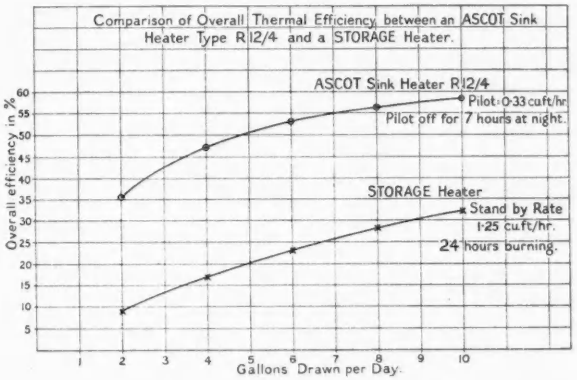
Position of Temperature Control.	Flow of water to open gas valve fully (galls. per min.).	Head of water (feet).	Flow of water at which Governor comes into operation (galls. per min.).	Head of water at which Governor comes into operation (feet).	Temp. Rise. (° F.)
5	1.06	9.84	1.21	26.3	107
4	1.35	13.1	1.47	32.8	88
3	1.67	16.4	1.8	39.3	72
2	2	19.7	2.2	45.8	59
1	2.73	29.5	2.9	65.5	45

Mr. Friedman went on to say that it was not true that the instantaneous gas water heater was a highly complicated piece of mechanism. On the contrary, he considered it to be a remarkably trouble-free appliance. With regard to the method of expressing outputs of water heaters, it would be very helpful if some standard method could be arrived at. At the moment it was expressed in terms of gallons per minute raised 40° F. or some other temperature, while he had come across a good deal of literature in which no temperature was mentioned at all.

He made a plea for a standard figure which would mean something, and suggested that outputs stated in B.Th.U. per minute would be a suitable figure, although certain standardization would be necessary before this could be done.

With regard to open type heaters, at this stage Mr. Friedman confined his remarks only to the question of efficiency. It varied according to the flow and the amount of evaporation, while it was also dependent upon whether the heater was truly vertically installed, whether it was subject to vibration, and so on, with the result that it was somewhat difficult to come down to a definite efficiency with this type of heater. With reference to the overall efficiency, or "practical efficiency," of the complete installation, this was a subject about which some information had been compiled which did not entirely agree with those arrived at by his firm, but it was impossible to argue on that point as no actual practical figures were available. This subject was being actively investigated by his firm, but it necessarily must take some time before figures were available. This, incidentally, would be the first time that practical tests in this connexion had been carried out.

Mr. Friedman criticized the statement in the Paper that a certain heater which had a bench efficiency of 80% gave a practical efficiency of only 10% with a half-pint draw off. The approach of the subject from this angle had no practical value, and was misleading; taking a well-known storage heater one could, by assuming similar draw-offs, and taking two extreme cases, arrive at efficiencies of either 0.05% or 0.04%. The following graph showed comparison in efficiencies between an instantaneous sink heater and a


Comparison of Overall Thermal Efficiency between an ASCOT Sink Heater Type R12/4 and a STORAGE Heater.
ASCOT Sink Heater R12/4
Pilot 0·33 cu ft/hr
Pilot off for 7 hours at night.
STORAGE Heater
Stand by Rate 1·25 cu ft/hr.
24 hours burning.
Overall efficiency in %
Gallons Drawn per Day.

storage water heater, and it would be seen that the instantaneous heater had a better overall efficiency for all quantities of water drawn.

With reference to the statement in the Paper that recent tests of a boiling water appliance showed a bench efficiency of only 40%, Mr. Friedman drew attention to the fact that the "Ascot" boiling water appliance type RS 52/1 had an efficiency of 75% on boiling, which was the highest efficiency ever obtained for a boiling water appliance by gas. In addition, no careful adjustment of control was required as the action of the "Ascot" was fully automatic, entirely independent of water temperature variations, gas and water pressure variations, and, to a large extent, variations in gas quality. Regarding the testing of bi-metal strips, Mr. Friedman stated that in his laboratories such strips as fitted to "Ascot" appliances had been subjected to tests exceeding 500,000 operations, without change.

Mr. **Cooper** said that the corrosion conditions in gas water heaters, so far as he had been able to discover, were among the most stringent met anywhere. One had a combination of high temperatures and concentrations of acid from dilute to very strong —and even when the acid was gone there were still the high temperatures. Apparently, in no other industry were these stringent conditions experienced. The Institution of Gas Engineers had been carrying out investigations on corrosion for some time, and while those investigations had shown up several very bad materials —which they could forget about—they did not represent actual conditions met within heaters as the tests had been on continuous operation, whereas it was well known that the bulk of the damage was done when the heater was being warmed up. It would be simple to design an alloy or finish to withstand one factor; but it was difficult to find one to withstand all conditions.

He considered that the instantaneous water heater was complicated, relatively, in comparison with other gas appliances, and he would like to bring in here the point that men trained solely to fit cookers and fires were not capable of fitting water heaters. To do this a man must be very highly trained and therefore more highly paid. Mr. Friedman had criticized the open type of heater on the score that the efficiency fell off with the rate of flow. They had, however, managed to overcome that. Mr. Friedman also mentioned vertical fixing; but Mr. Cooper thought that applied equally to all appliances. He was glad to know that work was going on in connexion with the problem of overall efficiency; they had done a certain amount in this direction at Watson House. He realized that half-a-pint was a very small draw-off; but there was a very big lowering of the practical efficiency as the draw-off was reduced.

Mr. **J. J. T. Monk** (Southampton) asked whether a water governor was necessary on a low-pressure supply.

Mr. **Cooper** replied that if the tank supply was adequate there was no need for such a governor.

Work of Research Board

The **President** (Mr. F. O. Hawes, Tottenham) observed that one point that had been brought out by the Research Committee of the Institution of Gas Engineers was that sulphur was not the only cause of corrosion. Even if they could produce a completely sulphur-free gas they would not have finished with the corrosion problem. Mr. Friedman had been dubious about the possibility of promoting joint action on this matter; but Mr. Hawes pointed out that the Gas Research Board had been developed to invite manufacturers into the fold. The problem should be attacked in the greatest good faith by everybody, and, as a member of the Joint Research Committee, he would feel most hurt if he thought that commercial considerations were to militate against the efficiency of the Research Board's work. Here was an organization for joint work, and it was to be hoped that it would be fully supported by everyone. With regard to combustion, water heating appliances gave very little trouble in this respect while clean.

Once they had decided on a design which was satisfactory from the point of view of the formation of CO and was reasonable as regards maintenance they did not get much trouble from the appliance. Work had been done recently on the effect of changes in the composition of the gas on the combustion. There were limits to the kind of gas that could be supplied, but where luminous flames were adopted these limitations were not so applicable. The luminous flame was now being applied in other directions than water heaters. It would seem that luminous flames could stand considerable changes in the quality of the gas without causing troubles which were noticeable to the consumer.

Mr. Hawes referred in conclusion to some investigations he had carried out to ascertain the average consumption of storage heaters when his Company were considering the offer of such a service on an "all-in" basis. They arranged a 20 ft. run to the bath, with shorter runs to other taps, and the overall efficiency was about 40%. On the four installations tested the gas consumption was very nearly one therm per diem in each case. This was a thoroughly practical test, and the 40% efficiency obtained was about half that of the various appliances on bench test. In conclusion, the President asked Mr. Cooper whether he thought the use of water softeners influenced corrosion.

Mr. **Cooper** said he had no personal experience as to the use of a water softener in combination with tinned copper; but below 7° Clark one would get rusty water with cast iron. Much of the trouble experienced with water softeners was due to their not being washed out often enough, with the result that one got a solution of brine in the water.

Vote of Thanks

A cordial vote of thanks was passed to Mr. Cooper for his Paper on the proposition of Capt. **W. J. Liberty**, seconded by Mr. **B. W. Dawkins** (the Hon. Secretary) which Mr. **Cooper** briefly acknowledged.

Trading Results in 1939

Vulcan Foundry, Ltd.

A continued improvement in the Company's business was reported by the Chairman at the annual general meeting of Vulcan Foundry, Ltd. The balance to the credit of the manufacturing account for the year 1939 was £175,596, compared with £143,503 for the 18 months to Dec. 31, 1938, an increase at the rate of, say, £80,000 per annum. The result of the year's working, after appropriating £56,000 for taxation reserve, enabled the Board to recommend a dividend of 5%, less income-tax, on the ordinary shares, carrying forward £27,356. As for the future, the order book showed that there was a full year's work on hand, and more.

Herbert Morris.—Interim 7½%, tax free, for year to July 31, 1940 (for 1938-39 interest 7½% was paid, followed by capital bonus 25, second interim 7½ and final 15).

Allen West & Co.—Profit £62,654 (£101,050); 7½% (same); no bonus (2½); building reserve £20,000 (nil); general reserve £19,066 (£35,000); fwd. £40,525 (£53,500).

United Flexible Metallic Tubing.—5% and bonus 6½% making 15 (13½); general reserve £5,000 (same).

ANNUAL MEETING OF THE WOMEN'S GAS COUNCIL

Mobile Canteen Presented to the Y.M.C.A

THERE was an excellent attendance of members at the Annual Meeting of the Women's Gas Council held under the Chairmanship of Mrs. Warren Pearl (vice-President) at Gas Industry House, on April 23. The occasion was marked by the presentation by Lady Milne-Watson of the mobile canteen, towards which all Branches of the W.G.C. have subscribed, to the Y.M.C.A. for use in connexion with the Association's work among H.M. Forces. It was accepted on behalf of the Y.M.C.A. by Mr. R. Austin Pilkington and was on view, fully equipped, outside Gas Industry House.

The business of the meeting included the adoption of the annual report and accounts and the election of officers and committee for the ensuing year. It will be a matter for gratification that the Marchioness of Londonderry has again consented to act as President of the Council.

The annual report contains a comprehensive survey of the work of the Council during the past year, and the following excerpts from it may be of general interest:

The last year for the Women's Gas Council, as for all other associations working for social service, has been one of severe test. The Council has proved that in the four short years of its existence the foundations of fellowship and corporate unity were truly laid. Members who had drawn together in friendship and understanding at social meetings in peace-time were united and prepared to answer the call to service when hard tasks had to be done.

In spite of difficulties which increased as the international situation became graver a new branch was started at Cirencester in May, 1939, and Burnley and North Finchley held inaugural meetings in April, 1939, and after war was declared Bridgwater formed a small Circle.

In the earlier part of the year there had been a great demand for lectures, and Miss A. M. S. Wilson, B.Sc., had visited many of the branches of the Women's Gas Council, as well as other women's meetings. Then for the first fortnight of September lectures were cancelled and plans altered. But even before the end of the month it was found that women felt the need of the social meetings to which they were accustomed. Requests for a speaker to talk at meetings poured into the office. All through the autumn and winter Miss Wilson has been speaking at meetings of branches of the Women's Gas Council, and of other societies such as Women's Institutes, Townswomen's Guilds, Community Centres, Women's Political Associations, Women's Branches of the British Legion, and Women's Voluntary Services.

The work of many societies and organizations has been dislocated by the outbreak of hostilities. Those associations who decided, in September, to carry on in face of all difficulties, are reaping their reward, for women are feeling the need to carry on their old interests in the changed conditions under which we are now living. All through the year the Women's Gas Council has tried to co-operate and work in conjunction with other organizations doing national service.

After the Munich agreement in September, 1938, and in some cases even before that date, branches of the Women's Gas Council organized lectures for the members in First Aid and Home Nursing. By the summer of 1938 arrangements had been made for 68 of these classes. In branches where no special arrangements had been made, members were able to attend classes organized independently from the Women's Gas Council, and members often did so in groups. These classes were arranged in collaboration with the British Red Cross and St. John's Ambulance, and members sat for the official examinations of these Societies at the end of their training.

Members of the W.G.C. inspect the Mobile Canteen outside Gas Industry House. Lady Milne-Watson is seen in the centre of the photograph with Mrs. Warren Pearl on her right

In many branches classes in large-scale catering and cookery were also arranged for members. Members who did not wish to do either nursing or cooking found some other outlet for their energies, taking short courses in Infant Welfare, or using the experience they already had. With this preparation it was possible for members to join up for national service in groups. In many places they did so.

In one Northern branch the majority of members had studied canteen work, the organizer of the Branch became Superintendent of a canteen which has been open day and night since the middle of September. This canteen has been organized with a brilliant attention to detail. In the autumn most of the branches formed knitting and needlework parties. In areas where the authorities will permit meetings, these have been combined with the usual meetings.

Speakers have visited the branches, and given their talks while the members have been doing their work. In other areas it has only been possible to hold small meetings, or to arrange for members to do work in their own homes, but even in these cases branches have adopted men in ships, R.A.F. units, or the local men serving in the Army. Besides supplying the men with knitted comforts, funds for cigarettes and sweets have been started and members have collected to send parcels to the men on all the fighting fronts.

Early in September one branch adopted two ships of the destroyer class, undertaking to supply the men with all the knitted comforts they required. Having achieved this while working for the local hospitals, the same branch has now adopted a minesweeper flotilla as well. Over a thousand garments have been

On the platform at the W.G.C. Meeting, left to right, Mr. F. J. Chamberlain (Secretary of the National Y.M.C.A. War Service Fund), Mr. R. Austin Pilkington (Joint Hon. Treasurer of the Y.M.C.A.), Miss A. M. S. Wilson (Assistant Secretary of the W.G.C.), Mrs. Warren Pearl (Vice-President of the W.G.C. and Chairman of the Meeting), Lady Milne-Watson (Vice-President and Hon. Treasurer of the Canteen Fund), Miss Wolseley-Lewis (Chairman of the Executive Committee), and Miss K. M. Halpin (Organizing Secretary)

despatched by this branch alone. The members have collected over £80 for wool, and the postage of the parcels of finished garments has cost over £30.

In every branch the members have found out what work is urgently required in the district and have organized themselves to do it. They are active in nursing, sewing for the local hospitals, knitting or preparing communal meals for children, in reception areas, and for workers in other districts.

The meeting concluded with a most interesting talk on the work of the Y.M.C.A. by Mr. Austin Pilkington and Mr. Chamberlain, who assured the members that they should be kept informed of the activities of their mobile canteen among the Forces.

Newcastle Bill

The earlier proceedings were summarized in last week's "JOURNAL"

AT the conclusion of the cross-examination of Mr. E. Crowther (the Chief Engineer of the Gas Company) evidence was given by the estate agent who advised the Company, and he stated that he could find no other suitable site for the proposed gasholder, having regard to the requirements of the Company in dealing with the developments to the north of Newcastle.

Mr. JACQUES ABADY, K.C., then opened the case against the Bill by the Gosforth Urban District Council and concerned himself for the greater part with the proposed site for the new gasholder. He impressed on the Committee that the site in question was part of a town planning scheme which had been prepared in 1938 and was actually a part of the scheme which was scheduled for residential property and for setting out for the purpose of adding to the amenities. The scheme had been lodged with the Ministry of Health, but owing to the war, the Minister had issued a circular stating that public enquiries into such schemes would have to be postponed. Otherwise, said Mr. Abady, the scheme would have been proceeded with in the ordinary way. It was impressed upon the Committee that Mr. Crowther, in his evidence, had not stated, as he was invited to do by Counsel for the promoters, that this site was necessary for the development in the northern part of the area but had said that it would be convenient. Although there had been objection to divulging the price per acre which would be paid by the Gas Company for the land if the Bill went through—and he respected that, having been informed personally what the price was—Counsel remarked that the average price of land in this area was between £200 and £350 per acre, and suggested that the price which would be paid was such that not only were the owners of the land being paid the full market value, but an amount also for compensation for damage to the property which was anticipated by reason of the gasholder being erected, and also an amount for an easement on the west to enable the Gas Company to bring in their mains. That might compensate the owners of the land, but there would be no compensation for those who had been unfortunate enough to buy houses in the neighbourhood which would overlook the gasholder if it were erected. The owner-occupiers of these houses were people who had put all their money into buying these houses or were buying them through building societies; the value of the houses was £700 or £800. Counsel said he would have thought that a large undertaking like the Newcastle Gas Company would have endeavoured to co-operate with the local authorities in choosing a site where a gasholder would not depreciate the value of residential property as would be the case here, where people had bought houses in the belief that they would be able to enjoy the amenities as they found them, having regard to the preparation by the Gosforth Urban District Council of its town planning scheme.

Some of the owner-occupiers were then called and stated that they had understood that the area around their houses would be reserved for residential property, and that they strongly objected to having a gasholder within sight of their front windows, as some of them would.

The final two days were occupied with evidence on behalf of the opposition of the Newcastle Corporation, and the speeches of Counsel. The evidence concerned solely the proposed site for the new gasholder and, as in the case of the Gosforth Urban District Council's opposition to this, the witnesses were those who had bought houses in close proximity to the site and who objected to a gasholder being erected close to them and interfering with the amenities.

Other matters raised in the petitions of the opponents affecting the basic and differential prices, &c., were dealt with by way of argument by the opposing Counsel

Mr. CRAIG HENDERSON, K.C., for the Newcastle Corporation, contended that the need for storage which the promoters had stressed was not so much for the northern areas as for the general requirements of the Company, for no additional storage capacity had been provided for 40 years. In these circumstances he urged that the Company should find a site in an industrial area where the presence of a gasholder would not depreciate the value of residential property.

Speaking of the basic and differential prices in the Bill he strongly urged the Committee to say that as far as the areas to be taken over and which were not proposed to be supplied until after the war were concerned, the prices should be left out of the Bill and should be fixed by the Board of Trade in the light of the conditions prevailing when it was proposed to give the supply.

Mr. JACQUES ABADY, K.C., for the Gosforth Urban District Council, asked that the Newcastle Company should be prohibited from supplying in the proposed added areas—except Morpeth—until the Board of Trade had fixed the basic and differential prices, after the war, when the Company desired to give a supply. He said there must be some data on which to fix these prices but in as much as it was not proposed to give a supply until after the war it was obvious the necessary data was not available at the present time.

Mr. SYDNEY TURNER, K.C., in his final speech for the promoters, impressed upon the Committee that on the matter of the prices, the gasholder site, and the other matters raised in opposition to the Bill, the only evidence—apart from that of the few house-owners who had been called—had been given by the promoters.

There was no desire on the part of the Newcastle Company to do anything which would forfeit the goodwill of the public in the area they served, and although he did not think it would be any benefit to the local authorities he said the promoters were willing to have inserted in the Bill a right to local authorities to apply for a revision of the differentials within three years of the supply being given in the added areas, except Morpeth.

The CHAIRMAN announced that Clauses 29 and 30 relating to basic and differential prices would remain in the Bill, subject to the right being given to the local authorities, as offered by Mr. Turner, to apply for a revision within three years after a supply being given in those outer areas where no supply was now available.

Clause 36, relating to the gasholder site, would also remain in the Bill subject to the offer to have only one gasholder and that not within 200 ft. of the southern portion of the site.

Clause 37, which modified the Company's Act of 1929 so that applications for revision of basic prices could be made at any time instead of at 5-yearly intervals, would also be passed.

The Committee would not accept the suggestion of the opponents that the Company should not make an increase of more than 12½% in its prices without the consent of the Board of Trade. Nor was the suggestion that existing differentials should be subject to revision. Finally, the Chairman said the proposals with regard to the Newbiggin area would remain in the Bill.

COMPANY MEETING

West Yorkshire Gas Distribution Company

The General Meeting of the Proprietors of the West Yorkshire Gas Distribution Company was held at 9, Clements Lane, Lombard Street, London, E.C.4, on Thursday, April 25, 1940, when the statement of accounts for the period commencing July 29, 1938 (date of incorporation), to Dec. 31, 1939, was approved.

The MANAGING DIRECTOR (Colonel W. M. Carr, O.B.E., T.D.) informed the meeting that the first stage, involving a total of 59½ miles of main, was practically completed prior to the outbreak of war. The mains system had been satisfactorily tested, and partial supplies were being carried through the system.

There had, unfortunately, been a delay in commencing full supplies to nine companies which were connected to the system owing to the breakdown at the Hemsworth Ovens. It was anticipated that by November, 1940, full supplies would be available, and the grid would then be drawing from four other sources of supply, and it was further anticipated that the Hemsworth Ovens would be in operation within twelve months.

There was no doubt that the Company would prove of great advantage to the gas undertakings, enabling them to give better and more uniform service than when operating small independent plants, and making available adequate supplies for industrial purposes, for which there was—as was anticipated—an extensive demand.

He was sure that the shareholders would be interested to know that the whole of the construction work of laying the mains was carried out in record time having regard to the magnitude of the work, and the whole system had been tested and proved to a pressure of 60 lb. per sq.in.

Company Meetings

BOMBAY GAS COMPANY, LTD.

The Annual Ordinary General Meeting of the Bombay Gas Co., Ltd., was held at the London Office of the Company, Moorgate Station Chambers, E.C.2, on Wednesday, April 24, Mr. WILLIAM GRAHAM BRADSHAW, C.B.E. (Chairman of Directors), presiding.

The SECRETARY (Mr. E. Comber) read the notice convening the meeting, together with the Auditors' Reports and the Report and Accounts were taken as read.

THE CHAIRMAN'S ADDRESS

Moving the adoption of the Directors' Report and Statement of Accounts for the year ended Dec. 31, 1939, the CHAIRMAN said: The first matter which I should mention to-day is the fact that since the last General Meeting the Company has been successful in obtaining for a period of eight years from March 1, 1940, a renewal of the public lighting contract on satisfactory terms. The Public Lighting load is about 40% of the Company's output so that you will appreciate that the safeguarding of this part of the Company's business for another eight years is a matter for satisfaction. It entails the lighting of 8,721 lamps with 24,142 mantles. I should like you to realize that all the latest forms of gas lighting have been installed from time to time in the streets of Bombay. The "Littleton" lamps predominate, but there are also "Supervia" lamps in use. I cannot leave the renewal of the public lighting contract without placing on record our congratulations to Mr. Lane for the able manner in which he has conducted the negotiations with the Municipal officials. I should also like to mention the name of the Company's Public Lighting Superintendent, Mr. J. P. Blackmore, who Mr. Lane reports, rendered him much valuable assistance.

Taking into account the difficulties which have confronted the Company during the past year, we can be well satisfied with both the working and the financial results. Although considerable new business was obtained last year, the increase in the sale of gas was only 3.6% more than that of the previous year. The international situation is to blame for this disappointment, although, as our General Manager in Bombay reports, we are thankful for this increase and are satisfied that the work which was done during the year will result in substantial increases in the Company's business when world conditions become once again normal. That we have not even to wait for these events is evidenced by the fact that during the months of January and February of the current year the sale of gas for heating purposes showed increases of 8.2% and 8.4% respectively.

Difficulties of Industrial Life

To enumerate shortly some of the difficulties with which Bombay industrial life has had to contend of late, I might mention that the Property Tax has been increased by 10%, which slowed down building developments considerably. The prohibition of the sale of intoxicating liquors which came into operation in August of last year also caused much distress through unemployment and trade disorganization. Sickness has played its part, and to crown all these difficulties the declaration of war on Sept. 3 caused the principal markets to cease functioning and building operations to stop entirely. Furthermore, the Congress Party resigned in the midst of all these troubles, bringing about much confusion. However, towards the end of the year conditions began to improve, and confidence is now to a great extent restored. In spite of these set-backs, the Company has been able to earn an 8% dividend with a good margin to spare, which, in the circumstances, you will agree is satisfactory.

Owing to the growth of the Company during the last few years considerable capital expenditure has had to be incurred, details of which we have given you in past years. The year 1939 was no exception as a new governor house was built and a boosting plant was installed. There are three trunk mains, and the connections to these three mains from the governors have had to be increased in the case of two of them from 12 in. to 18 in., and in the case of the third from 18 in. to 24 in. The job has been a difficult one and our Engineers in Bombay are to be congratulated in having changed over from the old governors and valves to the new ones without a hitch. Some six miles of new mains have been laid. The stores have had to be re-arranged and altered to cope with the constantly increasing business of the Company, entailing larger stocks of meters, cookers, water heaters, and refrigerators, as well as repairs. We have more than 12,400 meters on the district, which in itself illustrates the size of the Company to-day.

There are three of us still with the Company—viz., Mr. Lane, Mr. Comber, and myself—who can remember when the make of gas per annum was only just over 100 million cu.ft. To-day the make of gas is over 700 millions, and I think that we may be justly proud of the growth of the Company's business.

The Accounts

Turning to the accounts, you will notice that the rupee transactions have been converted into sterling at the par value of 1s. 6d. to the rupee, which will make comparisons with other years by previous printed accounts somewhat difficult and misleading.

The capital remains the same as at the end of 1938, but this does not really imply that *no* capital expenditure was incurred. The Board deemed it a prudent policy (as in previous years) to charge the revenue expenditure to the relief of capital, which amounted to £16,053. Before leaving the capital account, mention should be made of the Capital cost per million cubic feet sold which works out at £654. This is a record for the Company and is indicative of its sound position.

Revenue

The revenue for the year is in total £10,704 more than in the year 1938. Each branch of the Company's business has contributed towards this gratifying result. The sale of gas to private consumers has produced £3,861 more, due, as I have already stated, to an increased sale of 3.6%. In spite of the institution of a partial blackout, the gas sold for public lighting has brought in £1,842 more. The receipts from meter rentals and from the rent of refrigerators and cookers have increased by £1,712. Residuals also have in the aggregate helped to swell the total revenue by £3,286. Altogether the increase over the previous year is £10,704.

Coke is, and always has been, a difficult market, consequent upon the keen competition of which we have on more than one occasion told you. In spite of this, we sold 865 tons more at an average increased price of annas 14/7 (1s. 4d.) per ton. The price for the current year has in general been increased by Rs. 2 per ton, which will help towards counterbalancing the increased cost of coal which we shall have to meet during the current year.

Tar has produced £922 more, due to 4,805 more gallons having been disposed of at an average increase in price of a fraction over 2 annas per cwt. The price for the current year has been increased, which will in turn help to reduce the cost of coal. The production of Road Tars Nos. 1 and 2 to which I alluded last year has received careful attention, and 67,928 gallons were sold. This year we hope to improve still further on this figure.

Expenditure

The increase in the total revenue of £10,704 is offset by an increase in the expenditure of £10,017, but three items are responsible for this result—viz., coals, repair of works, and rents, rates, and taxes. The first item (coals) has cost £2,899 more.

The second item (repair and maintenance of works) shows an increase of £2,246, which is mainly due to the cost of the new governor house and boosting plant having been entirely charged to this account. The third item (rates and taxes) is more by £5,415, and you will not be surprised at this result seeing that the tendency to-day is for expenditure under this head to rise out of all knowledge. At the present time one is quite unable to judge or anticipate the extent to which rates and taxes will rise, but it is certain, I think, that they will not decrease for some time.

One more item to which I might refer is that of distribution, which shows a welcome decrease of £2,305. This is explained by the fact that although the cost of mains and services is up by £6,604 due to capital expenditure being included, the cost of repairing meters, stoves, and refrigerators is down by no less than £7,488, in spite of our having charged capital expended on these items to this account. The main reason for this decrease is the advent of the dry meter to Bombay. It is a much cheaper article than the wet one so that any capital expenditure charged to revenue in respect of meters is to be found here. Furthermore, the cost of packing, freight, and customs on a dry meter is infinitely lower than that of a wet one, which again reduces costs. The depreciation on a dry meter is also lower by reason of its smaller original cost, so that the Company seems to benefit in all directions by the introduction of the dry meter to Bombay.

The balance of profit of £32,734 is £687 more than in the previous year, and in view of the capital charge of £16,053 being included in revenue against one of £12,531 for the year 1938 I am sure you will agree that the result is satisfactory.

We carry this balance of £32,734 to the net revenue account No. 4. In this account we have appropriated to the reserve fund £2,818 and to the renewal and contingency fund £560, being interest on the balances in accordance with our usual practice.

We have depreciated to the market value at Dec. 31, 1939, our investments which has cost us £683. It is, however, satisfactory to note that since the end of the year these investments have appreciated in value by more than £1,342.

The sum available for dividend is £62,280, which, when compared with the figure for the year 1938 as converted at 1s. 6d. to the rupee, is £1,909 more. The Directors are recommending a final dividend of 4½%, less income-tax, making a dividend for the year of 8%, less income-tax. The amount then carried forward will be £48,780, or £3,133 more than the previous year.

Balance Sheet

The balance-sheet requires little explanation, but perhaps I should refer to one or two features. Cash in hand is £15,783 more, and the value of stocks are reduced by £3,444, which is gratifying, especially as the stock of coal shows an increase of £3,092 due to a larger quantity being in stock at the end of the year, which in turn is valued at a small increase due to higher cost. The total of accounts due to the Company is more by £2,922, but these have almost all been collected since.

I do not think there are any further comments necessary as regards the assets. On the liabilities side of the balance-sheet the only feature calling for any remark is perhaps the Provident fund, which now stands at £60,646. Indian legislation has enacted, however, that the members own contributions at least must be formed into a trust secured by investments as set forth in the Indian Trust Act of 1882, and next year it is probable that a large portion of this item will have disappeared from the balance-sheet. We are considering also placing the Company's contributions also in the hands of the Trust. The Board have the matter well in hand, and during the current year we hope to settle the question.

That completes my resumé of the accounts for the year 1939, and none of us would think it wise to say anything as to what the position may be in twelve months time. Probably costs will have an upward trend, but from the figures which we have had before us to-day we may, I think, reasonably expect that the business of the Company will continue to expand further. Of one thing we can be sure and that is that it will be through no lack of effort on the part of anyone connected with the Company either in Bombay or in London if the state of the Company's affairs at the close of the current year does not reveal as good as, or even a better, result than those we have before us to-day.

Tribute to the Staffs

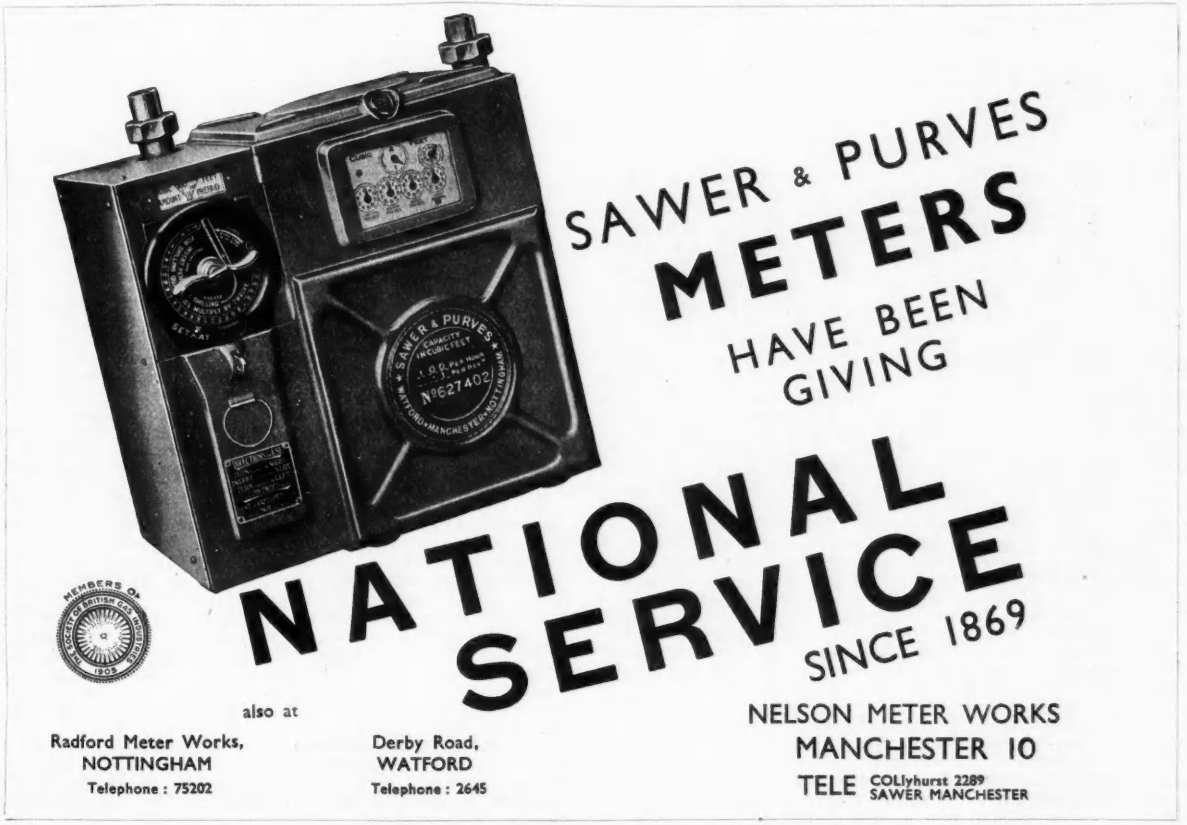
I cannot close without placing on record our appreciation of the efforts put forth by the European and Indian staffs to further the interests of the Gas Industry in Bombay. That they have spared no effort in that direction is evidenced by the accounts which we have just analyzed. Our General Manager and Engineer in Bombay, Mr. W. T. Lane, completes his fortieth year of service with the Company in Bombay in October next. He still enjoys excellent health and still shows commendable energy in the conduct of the Company's business. He is ably supported by the Deputy Manager, Mr. L. W. Boulter. Mr. Gladstone, whose services we share with our sister Company at Calcutta, has been in Bombay for the past nine months owing to the absence of Mr. Boulter on furlough, and it is gratifying to record that in his report Mr. Lane specially mentions Mr. Gladstone as having shown ability, zeal, and energy in the assistance he has rendered to him during those nine months. I should also like to mention the Accountant, Mr. A. Macdonald, and the Chief Clerk, Mr. Purshotum, both of whom Mr. Lane refers to specially in his report as having discharged their duties in the Accounts department with zeal and ability. The Superintendents, Mr. Sherret (Works), Mr. Woods (District), and Mr. Blackmore (Public Lamps), Mr. Petts (Erection), and Mr. King (Meters) continue to give the Company the best of their knowledge and experience, while the Indian staff serve the Company in no less a degree, for which we are satisfied and proud.

In London we have our Secretary, Mr. E. Comber, who is also a long-service official, being in his thirty-ninth year with the Company. He renders to the Board every help possible, while his assistant, Mr. M. E. Bush, who has already served 30 years with us, ably supports him. We have lost temporarily our Junior, Mr. Broom, who has joined H.M. Forces, and we wish him God Speed and a safe return.

The CHAIRMAN then formally moved:

> "That the Report of the Directors and the Audited Statement of Accounts for the year ended Dec. 31, 1939, presented to the meeting, be and the same are hereby received, approved, and adopted."

The DEPUTY-CHAIRMAN (Mr. H. H. Macleod) seconded the resolution, and there being no questions or comments from shareholders present, it was put to the meeting and carried unanimously.



Dividend

The CHAIRMAN thereafter moved:

"That a final dividend for the year ended Dec. 31, 1939, of 4½% (less income-tax at the rate of 3s. 11.169d. in the £) be now declared payable on and after May 1, 1940, making with the interim dividend of 3½% (less income-tax) a dividend of 8% (less income-tax) for the year."

This was seconded by Mr. A. M. PADDON, M.Inst. C.E., and unanimously agreed.

Re-Election of Directors and Auditors

Mr. GEORGE EVETTS, M.Inst.C.E., moved the re-election to the Board of Mr. H. H. Macleod and Mr. A. M. Paddon, being the Directors retiring by rotation at this meeting. In doing so, Mr. Evetts remarked that he had nothing more to say after what the Chairman had said about the Company and the Officers who served it. He knew most of the Officers personally and had seen the work they did and the esteem in which they were held not only by the workmen of the oCmpany, but also by the European and Indian population. The Directors were extremely gratified at the way they had secured the public lighting contract for another eight years, seeing that it meant so much to the Company.

The resolution was seconded by Mr. STANLEY H. JONES, M.Inst.C.E., and carried unanimously—Mr. MACLEOD and Mr. PADDON briefly acknowledging their re-election.

On the proposition of Mr. F. R. SMITH, seconded by Mr. H. F. HILL, the retiring Auditors (Mr. Alfred Morland, F.C.A., and Mr. F. J. Bradfield, F.C.I.S.) were unanimously re-appointed for the ensuing year at the same remuneration as heretofore. Mr. MORLAND thanked the meeting on behalf of himself and his colleague.

Votes of Thanks

The CHAIRMAN moved that the best thanks of the meeting be accorded to the Bombay and London staffs for their services during the past year.

Mr. PADDON, in seconding, said he could add nothing to what the Chairman had said in his address concerning the staff, but he heartily endorsed every word he had spoken on this subject.

The vote of thanks was unanimously accorded, and Mr. COMBER said it gave him great pleasure to acknowledge the vote on behalf of the staffs in India and London.

Mr. F. R. SMITH proposed a hearty vote of thanks to the Chairman and Directors for their wonderful report. It was, he thought, quite unique in these days to obtain a public lighting contract for eight years, and they congratulated the Board on their splendid negotiations.

The vote of thanks was seconded by Mr. BRADFIELD and carried unanimously; and, in reply, the CHAIRMAN said the Board were very pleased to see the shareholders on that occasion and to hear the kind remarks they had made; they were also very pleased to look forward to a happy meeting again next year.

This concluded the meeting.

CAPE TOWN AND DISTRICT GAS LIGHT AND COKE COMPANY, LTD.

The Fiftieth Ordinary General Meeting of the Cape Town and District Gas Light and Coke Company was held at the Registered Office of the Company, Africa House, Kingsway, W.C.2, on Friday, April 26, Sir L. GEORGE BARSTOW, K.C.B. (Chairman of Directors), presiding.

The ACTING SECRETARY (Mr. A. Blackburn) read the notice convening the meeting, together with the Auditors' Report, and the Directors' Report and Statement of Accounts for the year ended Dec. 31, 1939, as circulated to shareholders, were taken as read.

THE CHAIRMAN'S ADDRESS

Moving the adoption of the Report and Accounts, the CHAIRMAN said the results were rather more favourable than those of the previous year, for although revenue had again fallen, economies of expenditure had more than offset this reduction. With the exception of coal, reductions had been effected on all expenditure accounts, the total net decrease in expenditure being £3,225; these reductions might have been greater but for a rise in costs during the latter portion of the period under review. There had also been a reduction in Directors' fees. The increase in the cost of coal was mainly due to a rise in price, but in view of latest advices they were hopeful that they would not be faced with a further rise during the next twelve months.

Turning to the income side, the Chairman was glad to say that since he last addressed the shareholders they had succeeded in stimulating the residuals market, which had resulted in a better showing on this account. Revenue from sale of gas had again fallen and was attributable to the severe uneconomic competition which he dealt with at some length at their last meeting, and which continued unabated in their domestic business.

Gas sold for industrial purposes, however, continued to expand, and although this class of business was obtained in keen competition with other types of fuel, such competition was on a normal cost basis and, therefore, bore comparable relation to their own costs. The net result was that they had been able to increase the amount carried forward to next year's account by a small margin over the amount brought in—and this, they would observe, after making extra provision for plant renewals reserve of £1,455.

Continuing, the Chairman said he would now deal briefly with the question of the effect on the Company's business of the outbreak of war. So far the Company had not experienced the abnormal conditions which had affected a large section of the Gas Industry in this country. There was no blackout in Cape Town, but certain difficulties and delays in shipping materials from this country were inevitable. They were assured of adequate supplies of materials essential for carrying on their business, the principal item of these being coal—their policy having been always to support South African industries and products where possible. Those products which were necessarily shipped from this country did not fail to arrive safely at their Cape Town works. Nevertheless, it must be expected that the general increase in commodity prices and freights would affect their costs, but they were assured that their officials were carefully watching this situation.

The Company's Officials and staff continued to give unstinted loyal support in the face of very difficult trading conditions. The Chairman quoted the following excerpt from a report from their Engineer and General Manager in Cape Town:

"I must express appreciation of the splendid co-operation of the staff generally in their efforts to reduce working expenses, particularly the Heads of Departments, Messrs. Soole, Cotton, and Ratcliffe. A great deal of extra work and responsibility has fallen upon them owing to reduced personnel, and the additional services required have always been ungrudgingly given."

The Chairman was sorry to say that Mr. R. W. Blackburn, their colleague and Secretary, was unable to attend this meeting owing to a severe attack of influenza from which he was not yet fully recovered. He expressed the hope that Mr. Blackburn would very shortly be restored to health.

The CHAIRMAN then moved:

"That the Directors' Report and Statement of Accounts for the year ended Dec. 31, 1939, now presented, be and are hereby adopted by this meeting."

The resolution was seconded by Mr. EDWIN NICHOLLS, and there being no questions or comments by shareholders, it was put to the meeting and unanimously adopted.

Election of Director and Auditors

The CHAIRMAN said he had to report with much regret that Mr. W. J. Bradford had found it necessary to resign from the Board, partly for health reasons and partly due to the increased demands of his practice consequent upon his two sons being called to the Colours. Mr. Bradford had been a Director since 1923 and still retained his interest in the Company. To take Mr. Bradford's place on the Board Mr. A. E. Hayes was elected a Director. Mr. Hayes had been intimately connected with the Gas Industry for a number of years and was a shareholder of the Cape Town Company of long standing. He had pleasure in formally proposing his re-election to the Board.

Mr. NICHOLLS said it gave him particular pleasure to second this resolution, because for many years he and Mr. Hayes used to sit side by side in the body of the room. He was very glad to see him now on this side of the table, for they had already found his knowledge very useful, and his presence on the Board was a distinct acquisition to the Company.

Acknowledging his re-election, which was carried unanimously, Mr. HAYES said he had been connected with the Gas Industry during the whole of his business life. He was sorry the Cape Town Company was not in a better position at the present time; but they hoped things would improve. In the meantime they must maintain the goodwill of the business intact, which would ultimately benefit the shareholders.

On the proposition of Mr. S. J. TUNGAY, seconded by Mr. A. BLACKBURN, the Company's Auditors (Messrs. Kemp, Chatteris, Nichols, Sendell, & Co.) were re-appointed for the ensuing year at the same remuneration as heretofore, and this concluded the business of the meeting.

GAS STOCKS AND SHARES

The City gave the Budget a good reception. The details of the two new features—the purchase tax and the limitation of ordinary dividends—have yet to be fully understood, though it is evident that the latter proposal will have a marked effect on Stock Exchange business and values. In the main, however, the provisions met with general approval. The Budget gave a fillip to gilt-edged stocks all of which showed gains of anything up to 2 points on the week—2½% Consols closing 1½ higher at 74. Business in the industrial market was almost at a standstill for a time, and after a sharp reactionary period some improvements took place towards the end of the week, though the tone generally was dull. Oil shares were a shade steadier and rubber shares should show improvement.

The Budget had little, if any, effect on the Gas Market. Business was fairly good at the opening though the volume eased up as the week progressed. Prices were well maintained and it will be seen in the list below that very few quotations were affected either way. Several improvements occurred on the Provincial Exchanges, while nominal quotations in the Supplementary List remained unchanged. It would appear that the "limitation of dividends" proposals will affect gas undertakings operating in this country by prohibiting any increase in the authorized *amount* of dividend over and above the highest *amount* distributed in any of the three "standard years," viz., the accounting periods ending after June 30, 1936, and before July 1, 1939. Any company, however, which has paid less than 4% in these years will, if other circumstances permit, be authorized to pay this rate.

There is not a great deal of gas stock available at the present time especially among preference and debenture issues, though the following parcels of ordinary stock are on offer:

£		Dividend Basis. %	Price.	Gross Yield. % £ s. d.
1,000	British	7½	100	7 10 0
2,500	Commercial...	3	49	6 2 6
2,000	Gas Light Units	4½	178	5 5 10
500	Oriental	8	120	6 13 3
1,000	South Metropolitan	4½	72	6 5 0
1,500	South Suburban	4½	81	4 11 0
1,000	United Kingdom £1	5	16s	6 5 0

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
1,767,439	Mch. 11	8	7	Alliance & Dublin Ord. ...	112—117	+2
374,000	Dec. 27	4	4	Do. 4 p.c. Deb. ...	80—90	...
877,576	Nov. 6	5	5	Asscd. Gas & Water U'd'ts Ord.	14/6—16/6	...
500,000	"	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	16/6—18/6	...
535,545	"	4	4	Do. 4 p.c. Red. Cum. Pref.	15/—17/—	...
318,730	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/6—15/6	...
750,000	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
560,070	Feb. 19	7	7	Barnet Ord. 7 p.c.	122—127	...
300,000	Apl. 8	1/9⅜	1/9⅜	Bombay, Ltd.	19/6—21/6	...
181,915	Feb. 26	9½	9½	Bournemouth Sliding Scale ...	145—150	...
690,526	"	7	7	Do. 7 p.c. max. ...	118—123	...
493,960	"	6	6	Do. 6 p.c. Pref. ...	116—121	...
50,000	Dec. 18	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	"	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	"	5	5	Do. 5 p.c. Deb. ...	105—110	...
357,900	Feb. 19	7½	6¾	Brighton, &c., 6 p.c. Con. ...	103—108	...
659,955	"	6¾	5⅞	Do. 5 p.c. Con. ...	100—105	...
205,500	"	6	6	Do. 6 p.c. 'B' Pref. ...	103—108	...
855,000	Mch. 11	7	8	British Ord.	92—102	...
100,000	Dec. 18	7	7	Do. 7 p.c. Pref.	120—125	...
350,000	"	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	"	4	4	Do. 4 p.c. Red. Deb.	77—82	+2
450,000	"	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—¾	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—¾	...
150,000	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	53—58	...
626,860	Jan. 29	6	5⅗	Cardiff Con. Ord.	103—108	...
237,860	Dec. 18	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
98,936	Apl. 8	2/—	2/—	Colombo Ord.	1½—1¾	...
24,510	"	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/—22/—	...
739,453	Mch. 26	—/11.48	—/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	...
296,144	"	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/—22/—	...
1,775,005	Jan. 29	4	2	Commercial Ord.	47—52	...
140,000	Feb. 19	4	4	Do. 4 p.c. Red. Pref. ...	87—92	...
620,000	Dec. 11	3	3	Do. 3 p.c. Deb.	62—67	...
286,344	Feb. 19	5	5	Do. 5 p.c. Deb.	95—100	...
200,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	93—98	...
807,560	Feb. 12	7	7	Croydon sliding scale	100—105	...
644,590	"	5	5	Do. max. div.	87—92	...
620,385	Dec. 7	5	5	Do. 5 p.c. Deb.	100—105	...
208,660	Feb. 19	5	5	Dudley, Brierley Hill & Dist. Ord.	98—103	...
82,275	"	5	5	Do. 5 p.c. Con. Pref. ...	93—98	...
79,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	93—98	...
239,000	Jan. 29	5	88/6	East Hull Ord. 5 p.c.	70—80	...
187,215	Feb. 12	5⅜	5⅜	East Surrey Ord. 5 p.c. ...	93—98	...
176,211	Dec. 18	5	5	Do. 5 p.c. Deb. ...	100—105	...
250,000	Nov. 13	8	4	Gas Consolidation Ord. 'B' ...	15/—17/—	...
250,000	"	4	4	Do. 4 p.c. Red. Cum. Pref.	16/—18/—	...
19,152,410	Jan. 29	5⅜	3⅜	Gas Light & Coke Ord. ...	16/—17/—a	...
2,600,000	"	3½	3½	Do. 3½ p.c. max.	62—67	...
4,477,106	"	4	4	Do. 4 p.c. Con. Pref. ...	86—91	...
2,993,000	Jan. 2	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	87—92	...
8,602,497	Nov. 27	3	3	Do. 3 p.c. Con. Deb. ...	75—80	...
3,642,770	"	5	5	Do. 5 p.c. Red. Deb. ...	105—110	...
3,500,000	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	102—107	...
700,000	Mch. 11	3½	3½	Do. 3½ p.c. Red. Ded. ...	87—92	...
270,466	Feb. 19	6	6	Harrogate New Cons.	93—98	...
157,500	Apl. 8	‡1/—	‡1/—	Hong Kong and China Ord. ...	½—¾	...
5,600,000	Oct. 23	12	4	Imperial Continental Cap. ...	69—74	−3
172,810	Jan. 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	80—85	...
63,480	Dec. 18	3	3	Maidstone 3 p.c. Deb.	55—60	...
45,000		†10	†8	Malta & Mediterranean ...	92—102	...
				Metropolitan (of Melbourne) ...		
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	93—98	...
231,977	Feb. 19	5	5	M.S. Utility 'C' Cons.	75—80	...
968,658	"	4	4	Do. 4 p.c. Cons. Pref. ...	85—90	+3
390,076	Dec. 18	4	4	Do. 4 p.c. Deb. ...	85—90	...
148,955	Dec. 18	5	5	M.S. Utility 5 p.c. Deb. ...	103—108	...
125,000	Jan. 2	3½	3½	Do. 3½ p.c. Red. Bds. ...	90—95	...
675,000	Nov. 6	†3	†4	Montevideo, Ltd.	60—65	...
250,000	Mch. 18	7½	5 7/10	North Middlesex 6 p.c. Con. ...	103—108	...
396,160	Jan. 29	5	5	Northampton 5 p.c. max. ...	90—95	...
300,000	Nov. 6	†7	9	Oriental, Ltd.	115—120	...
468,537	Dec. 11	8	7	Plymouth & Stonehouse 5 p.c.	118—123	...
621,667	Feb. 5	8½	8½	Portsmouth & Gosport Cons.	110—115	...
241,446	"	5	5	Do. 5 p.c. max.	85—90	...
73,350	"	5	5	Do. 5 p.c. Pref.	90—95	...
75,000	"	4	4	Do. 4 p.c. Pref.	75—80	...
114,000	Feb. 5	5	5	Preston 5 p.c. Pref.	88—93	...
247,966	Dec. 18	4	4	Primitiva 4 p.c. Cons. Deb. ...	93—98	...
625,959	Jan. 15	4	4	Do. 4 p.c. Red. Deb. ...	91—96	...
15,000	Mch. 11	6	6	San Paulo 6 p.c. Cum. Pref. ...	7½—8½	...
441,275	Oct. 9	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	17/—19/—	...
460,810	Mch. 11	—/10⅝	—/10⅝	" " 4½ p.c. Cum. Pref. ...	16/6—18/6	...
133,201	Feb. 12	8½	5	Shrewsbury 5 p.c. Ord. ...	105—115	...
9,000	June 5	†4	†4	South African Ord.	4—5	...
1,996,297	Aug. 21	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	16/—18/—	...
1,000,000	Mch. 4	—/10⅜	—/10⅜	Do. 4½ p.c. Red. Cum. Pref.	16/6—18/6	...
769,191	"	4	4	Do. 4 p.c. Cum. Pref. ...	15/—17/—	...
450,000	Feb. 12	4	4	Do. 4 p.c. Red. Deb. ...	95-100	...
150,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
6,709,895	"	5	4	South Met. Ord.	68—73	−1
1,135,812	"	6	6	Do. 6 p.c. Irred. Pref. ...	107—112	...
850,000	"	4	4	Do. 4 p.c. Irred. Pref. ...	80—85	...
1,895,445	Dec. 27	3	3	Do. 3 p.c. Deb.	72—77	...
1,000,000	Jan. 15	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
600,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
1,543,795	Feb. 5	6	3	South Suburban Ord. 5 p.c. ...	77—82	...
512,925	"	5	5	Do. 5 p.c. Pref.	95—100	...
500,000	"	4	4	Do. 4 p.c. Pref.	82—87	...
250,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	89—94	...
888,587	Dec. 11	5	5	Do. 5 p.c. Deb.	105—110	...
250,000	"	4	4	Do. 4 p.c. Deb.	85—90	...
200,000	Feb. 12	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
427,859	Apl. 15	—/9⅜	1/2⅜	S. Western Gas & Water Ord.	13/—15/—	...
160,523	"	—/10⅜	—/10⅜	Do. 4½ p.c. Red. Cum. Pref.	16/6—18/6	...
110,000	Dec. 18	4	4	Do. 4 p.c. Red. Deb. ...	90—95	...
750,541	Feb. 5	5	5½	Southampton Ord. 5 p.c. ...	77—82	...
148,836	Dec. 27	4	4	Do. 4 p.c. Deb.	85—90	...
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	97—102	...
200,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—100	...
1,076,490	Feb. 26	6½	5	Tottenham and District Ord....	94—99	...
409,835	"	5½	5½	Do. 5½ p.c. Pref.	103—108	...
62,235	"	5	5	Do. 5 p.c. Pref.	95—100	...
453,380	Dec. 11	4	4	Do. 4 p.c. Deb.	85—90	...
1,247,505	Oct. 23	6	4	U. Kingdom Gas Cor. Ord. ...	14/—16/—	...
1,085,952	Nov. 20	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	15/—17/—	...
772,709	"	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	14/6—16/6	...
745,263	Dec. 18	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	13/6—15/6	...
1,093,656	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	84—89	...
378,106	Mch. 11	7	7	Uxbridge, &c., 5 p.c.	95—100	...
133,010	"	5	5	Do. 5 p.c. Pref.	95—100	...
1,371,138	Feb. 5	6½	3½	Wandsworth Consolidated ...	88—93	...
2,525,768	"	4	4	Do. 4 p.c. Pref.	84—89	...
1,343,964	Dec. 18	5	5	Do. 5 p.c. Deb.	105—110	+2
383,745	"	4	4	Do. 4 p.c. Deb.	85—90	...
400,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	90—95	...
558,342	Jan. 29	6¾	6	Watford and St. Albans Ord. ...	95—100	...
200,000	"	5	5	Do. 5 p.c. Pref.	95—100	...
200,000	"	5½	5½	Do. 5½ p.c. Pref.	100—105	...
200,000	"	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90	...
100,000	"	33/4§	4	Do. 4 p.c. Red. Pf. (1959)	93—98	...
200,000	Dec. 11	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...

a.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Apl. 26.	Rise or Fall on Week.
202,152	Mch. 18	5	5	Ascot Ord.	80—85	...
128,182	Dec. 27	5	5	Do. 5 p.c. Pref. ...	88—93	...
31,035	Mch. 4	-/9 5/8	-/9 5/8	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
17,000	Feb. 19	8	8	Bognor Orig. Ord. 'A' ...	102—112	...
62,210	,,	8	8	Do. New Add. 'A' ...	102—112	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	95—105	...
37,440	Jan. 29	10	10	Cam. Univ. & Town 10 p.c. max.	145—155	...
125,970	,,	7	7	Do. 7 p.c. max.	105—115	...
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	Jan. 29	4½	4½	Cardiff 4½ p.c. Pref. ...	90—95	...
55,520	Feb. 19	6	6	Colchester 6 p.c. Pref.	95—100	...
90,550	Mch. 18	5	5	Do. 5 p.c. Deb. ...	98—103	...
150,000	Feb. 12	4	4	Croydon 4 p.c. Pref.	82—87	...
130,000	Dec. 27	4	4	Do. 4 p.c. Deb.	85—90	...
65,000	Mch. 4	7½	6 7/8	Eastbourne 'A' 5 p.c.	105—115	...
198,000	,,	6	5 5/8	Do. 'B' 3½ p.c.	90—100	...
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	Dec. 18	5	5	Do. 5 p.c. Deb.	98—103	...
130,500	Feb. 19	7½	7½	Exeter New Ord. (£10)	12—14	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	15—20	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	10—15	...
51,160	Dec. 11	5½	5½	Do. 5½ p.c. Deb.	102—107	...
152,600	Feb. 26	8	9	Guildford Cons.	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	Dec. 11	5	5	Do. 5 p.c. Deb.	90—95	...
156,600	Feb. 19	7	5	Hampton Court Cons. ...	75—85	...
86,046	June 19	‡14½	‡5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/6—15/6	...
80,000	Feb. 12	4	4	Lea Bridge 4 p.c. Pref.	65—75	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	Dec. 18	4	4	Do. 4 p.c. Deb.	88—93	...
73,620	Mch. 18	8½	8½	Luton Cons. 'A'	115—125	...
107,960	Feb. 26	4	5½	Mid Kent Ord. (£10)	7½—8½	...
230,940	Feb. 5	10	10	Oxford & District Ord. ...	135—145	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—90	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	Oct. 30	7½	7½	Peterborough Ord.	140—150	...
64,990	Mch. 18	7	7	Redditch Ord.	100—110	...
166,850	Feb. 19	8	8	Romford Ord.	108—118	...
60,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Mch. 18	5	5	Do. 5 p.c. Deb.	97—102	...
25,570	Feb. 12	5¼	5½	Rugby 5½ p.c. Pref.	95—105	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	De. 11	5½	5½	Do. 5½ p.c. Deb.	103—108	...
110,950	Feb. 26	8	8	Ryde Ord.	100—110	...
270,086	Mch. 18	7	7	Slough Ord.	98—103	...
21,000	Dec. 11	5	5	Do. 5 p.c. Deb.	92—97	...
28,872	Nov. 6	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Mch. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
127,228	Feb. 19	5	7	Swindon Cons.	75—80	...
60,425	Dec. 18	5	5	Do. 5 p.c. Deb.	92—97	...
64,380	,,	5	5	Torquay & Paignton 5 p.c. Pref.	82—87	...
130,000	Feb. 12	5	5	Wakefield Ord	85—95	...
81,650	,,	5	5	Do. 5 p.c. max.	75—80	...
82,000	Jan. 29	6	6	Weymouth Ord.	82—87	...
273,626	Feb. 12	7	7	Wolverhampton Cons. Ord. ...	115—120	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	Dec. 18	5½	5½	Do. 5½ p.c. Red. Deb. ...	100—105	...
106,490	Mch. 18	5½	5½	Wrexham Ord	75—85	...
90,000	Dec. 18	5	5	York 5 p.c. Red. Deb.	95—100	...
133,640	Feb. 19	6	6	Yorktown (Cam.) 5 p.c. Cons.	82—87	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—90	...
35,000	Dec. 18	5½	5½	Do. 5½ p.c. Deb.	103—108	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
347,756	Feb. 12	5	6	Bath Cons.	105—107	+1½
1,667,250	Feb. 5	5	5	Bristol, 5 p.c. max.	105—107	...
120,420	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	98—101	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	98—101	...
328,790	,,	5	5	Do. 5 p.c. Deb.	115—117	...
274,000	Feb. 26	5	5	Newport (Mon.) Ord.... ...	91—94	...
13,200	Mch. 26	7	8⅝	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½	-½
13,600	,,	5	6	Do. 7 p.c. 'B'	10—11	...
40,000	,,	5	6	Do. 7 p.c. 'C'	10—11	...
140,778	Feb. 12	5	5	Weston-super-Mare Cons. ...	92—96	...
64,338	Dec. 27	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
157,150	Feb. 5	5	6½	Chester 5 p.c. Ord.	98—101	...
92,500	Dec. 18	4	4	Do. 4 p.c. Pref.	80—84	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	85—88	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—99	...
2,167,410	Feb. 19	6	6	Liverpool 5 p.c. Ord.	108—110	+1
245,500	Dec. 18	5	5	Do. 5 p.c. Red Pref. ...	95—100	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	Feb. 5	10	8	Preston 'A' 10 p.c.	165—175	...
188,219	,,	7	7	Do. 'B' 7 p.c.	123½—133½	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
122,577	Feb. 19	7	7	Blyth 5 p.c. Ord.	113—118	...
732,000	Feb. 19	4	4	Hartlepool G. & W. Co. & New	65—67	+2
2,430,267	Feb. 5	5	5 7/10	Newcastle & Gateshead Con.	20/—21/-*	...
682,856	,,	4	4	Do. 4 p.c. Pref.	92—94	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	84—86	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	102—104	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	111—113	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
542,270	Feb. 12	6	9	Derby Con.	103—108	...
55,000	Dec. 18	4	4	Do. 4 p.c. Deb.	98—103	...
20,000	Dec. 18	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	100—105	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 26.	Rise or Fall on Week.
10,000	Feb. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
1,806,339	Feb. 26	6½	6½	Sheffield Cons.	125—127	...
95,000	Jan. 2	4	4	Do. 4 p.c. Deb.	98—100	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

THIS WEEK'S ADVERTISERS

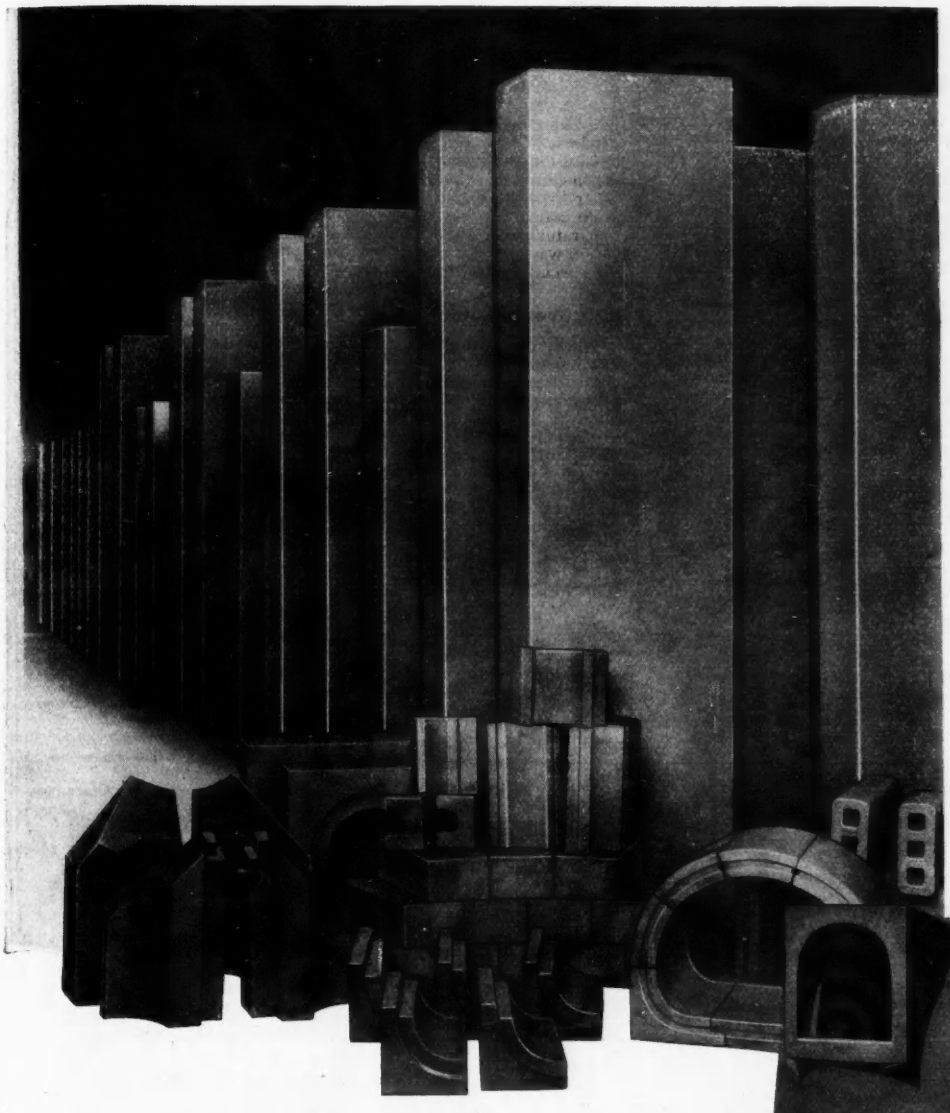
	PAGE
Abbott, Birks, & Co., Ltd.	224
Alder and Mackay, Ltd.	264
Ashmore, Benson, Pease, & Co., Ltd. ...	230
Averill C. R., Ltd.	231
Baldwins, Ltd.	218
Bale & Church, Ltd.	265
Balfour. Henry, & Co., Ltd.	218
Blakeley, Firth, Sons, & Co., Ltd. ... Cover II,	266
Broadbent, J. C., & Co., Ltd.	266
Brotherhood, Peter, Ltd.	233
Clayton, Son, & Co., Ltd.	262
Clough (Croydon), Ltd. ... ... Cover IV	
Cookson Lead & Antimony Co., Ltd.	227
Cowan, W. & B. ... ... Cover III	
Dempster, R. & J., Ltd.	217
Dempster, Robert, & Sons, Ltd. ...	...244, 266
Derbyshire Silica Firebrick Co., Ltd.	268
Donkin Co., Ltd. (The Bryan) ... Cover II	
Drakes, Ltd.	223
Durasteel Roofs Ltd.	227
Eagle Range and Grate Co., Ltd.	231
Ellison Insulations Ltd.	265
Foster, Blackett & James, Ltd.	227
Gas Meter Co., Ltd. ... ... Cover IV	
Gas Purification and Chemical Co., Ltd. ...	265
Glover, Thos., & Co., Ltd.	234
Grace, Henry & Co.	227
Holmes, W. C., & Co., Ltd.	267

	PAGE
Humphreys & Glasgow, Ltd.	232
Incandescent Heat Co., Ltd.	224
Keith Blackman, Ltd.	268
King, Walter, Ltd.	264
Kleenoff Co.	265
Lench, Thos. W., Ltd.	265
Librex Lead Co., Ltd.	227
Locke, Lancaster & W. W. & R. Johnson & Sons, Ltd.	227
London Lead Oxide Co.	227
Macpherson, Donald, & Co., Ltd.	221
Main, R. & A., Ltd.	252
Mewburn, Ellis, & Co.	266
Milne's Meters, Ltd.	222
Mobberley & Perry, Ltd.	261
National Savings Committee	249
New Bowson Coal Co.	264
Parkinson Stove Co., Ltd. ... ... Cover I	
Parkinson, W., & Co.	234
Philplug Products, Ltd.	225
Radiation, Ltd.	...250, 251
Reavell & Co., Ltd.	264
Saunders Valve Co., Ltd.	268
Sawer & Purves	255
Slingsby, Walter, & Co., Ltd.	226
Smith Meters, Ltd.	257
South Hetton Coal Co., Ltd.	265
South Metropolitan Gas Company	263

	PAGE
Spencer-Bonecourt, Ltd.	227
Stewarts and Lloyds, Ltd.	28
Strachan & Henshaw, Ltd.	265
Sutcliffe, Speakman & Co., Ltd.	230
Trier Bros., Ltd.	Cover IV
Trotter, Haines, & Corbett, Ltd.	265
Vale, Thos., & Sons, Ltd.	226
Vulcan Stove Co., Ltd.	220
Walker, C. & W., Ltd.	222
Walkers, Parker & Co., Ltd.	227
Walsall Locks & Cart Gear Ltd.	266
Watkins & Watson, Ltd.	266
Wellington Tube Works, Ltd.	Cover IV
West's Gas Improvement Co., Ltd.	258
Whessoe Foundry & Engineering Co., Ltd...	219
Wilkes, A. H., & Co.	226
Woodall-Duckham Co., Ltd.	243
Wright, Alex., & Co., Ltd.	229
Wright, John, & Co., Ltd.	221

	PAGE
Appointments Vacant and Wanted	266
Contracts Open	266
Patents	266
Plant, &c.	266
Plants, &c., Wanted and for Sale	266
Publications	265

(Current Sales of Gas Products will be found on page 263 and Trade News on page 262).



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Trade News

"Broomwade" Plants

Four exceptionally interesting jobs are described in the current number of the "Broomwade News Bulletin," published by Broom & Wade, Ltd., High Wycombe. The first is a pair of lorry-mounted air compressor plants recently supplied to the Post Office Engineering Department, with carefully arranged accommodation for comprehensive tool equipment. The concrete breakers, rock drills, clay spades, backfill rammers, drill steels, &c., are so disposed that any tool can be taken out, used and replaced without disturbing any other, and all the tool boxes and steel side sheets for enclosing the compressor plant are arranged for locking up to secure the equipment against interference or pilfering when the vehicles are left unattended. Next is a "Broomwade" cutting-off and face-grinding machine for cutting to length bar stock and special sections in ferrous and non-ferrous materials, facing to length structural members during erection, and for reconditioning the hammering surface of percussive tools. The third is an account of dimpling and dimple rivetting with "Broomwade" pneumatic equipment in aircraft construction, and the fourth article describes the applications of portable sleeve valve air compressors in shipbuilding and repairing.

British Control Equipment

The British Thermostat Co., Ltd., of Windmill Road, Sunbury-on-Thames, manufacturers of automatic control equipment for all industries employing heating processes, are engaged in an interesting war effort to save shipping tonnage by the use of British-made equipment. A good deal of foreign-made equipment is still in use in this country, owing to the fact that the plant which is controlled was of foreign origin and was originally supplied complete with control equipment, but war time restrictions are now making it impossible to obtain supplies either for replacement of existing gear or for new installations, and in many cases it is not possible to have even urgent repairs carried out. The British Thermostat Company has always maintained a department to build special equipment to meet individual requirements, and this department has been greatly extended in scope to meet the special circumstances arising out of the war. The repair and service organization has been widened to embrace work on equipment other than the Company's own make, and it is claimed that there is no control problem for which the Company cannot now supply apparatus either from its regular range or, provided that the application warrants the cost of special hand-made equipment, by building special control instruments.

Improved Water Cooled Compressors

Worthington-Simpson, Ltd., of Newark-on-Trent, have just developed a new series of high-speed single and two-stage water-cooled compressors embodying the latest developments in air compressor design. The new compressors have proved very successful on test, and over 20 of them are now going through the shops on various orders. They are described in the Company's Bulletin WS. 1801, in which emphasis is laid on the following features: Compact construction, accessibility of all parts from the floor line, automatic lubrication to all working parts, perfect balance, smooth running; cylinder and cover with valves amply cooled, ensuring cool delivery air and long life to valves; and special vertical type intercooler on two-stage machines for highest efficiency.

Bracket and Turret Clocks

The "Pul-syn-etic" system of electric turret and bracket clocks is the subject of a recently republished catalogue (Book 5, Section 2J) from Gent & Co., Ltd., Faraday Works, Leicester. The book is considerably larger than the earlier edition and includes illustrations of many newly installed clocks on industrial and public buildings.

Current Sales of Gas Products

The London Market

April 29.

There is little of interest to record in the London tar products market, to-day's values being as under: Pitch about 50s. per ton f.o.b.; creosote, 5d. per gallon; refined tar, 3¾d. to 4d. per gallon; the price of pure toluole under the Ministry of Supply Order is just under 2s. 5d. per gallon; pure benzole, 1s. 10d.; 95/160 solvent naphtha, 1s. 11d.; and 90/160 pyridine, 16s. to 17s., all per gallon naked; refined naphthalene crystals about £22 per ton in bags, all *ex* makers' works.

The Provinces

April 29.

Crude Gas-Works tar, 24s. 9d. to 29s. 9d.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 42s. 6d. to 47s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 47s. 6d.* **Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold).** Coal tar, crude naphtha, in bulk, North, 9d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4¼d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's. 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, April 27.

Market conditions are relatively quiet although prices show no alteration.

Crude gas-works tar.—Actual value is 39s. to 40s. per ton *ex* works in bulk.

Pitch is now only available in limited quantities at about 40s. per ton f.o.b. for export, and about 37s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—Home business is slow to move with controlled price at 4¼d. to 4½d. per gallon. In export a moderate business is being conducted at 3d. to 3¼d. per gallon, both f.o.r. naked.

Creosote oil.—Some prompt and early business is being arranged at current prices as follows: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6¼d. to 6½d. per gallon; neutral oil, 5¼d. to 5¾d. per gallon; all *ex* works in bulk.

Cresylic acid remains quiet with quotations as under: Pale, 97/99%, 2s. 1d. to 2s. 2d. per gallon; dark, 97/99%, 1s. 10d. to 1s. 11d. per gallon; pale, 99/100%, 2s. 6d. to 2s. 8d. per gallon; all *ex* works in buyers' packages.

Crude naphtha.—Available supplies are valued at round 6d. to 6½d. per gallon, *ex* works in bulk.

Solvent naphtha remains steady with 90/160 grade at 1s. 8d. to 1s. 9d. per gallon and 90/190 heavy naphtha at about 1s. 4d. to 1s. 5d. per gallon.

Motor benzole is 1s. 6¼d. to 1s. 7d. per gallon.

Pyridine.—Prices are nominal at 18s. to 19s. per gallon for 90/160 grade and 20s. to 21s. per gallon for 90/140 grade.

Contracts Advertised

Benzole Plant Removal.
Blackpool Gas Department. [p. 266.]

Bed of Retorts.
Goole Gas Department. [p. 266.]

Gas Purifier Preheater.
Goole Gas Department. [p. 266.]

Trading Result in 1939

C. & W. Walker, Ltd.

Reviewing the more important items in the accounts at the 42nd Ordinary General Meeting of C. & W. Walker, Ltd., the Chairman and Managing Director (Mr. R. J. Milbourne), said: You will notice an increase of £24,793 in investments, which is due to the fact that during the year we made a further investment in British Government securities of that amount, and we have had a further debenture of £150 repaid. With regard to the leasehold depreciation reserve, we have only placed £1,000 this year to that reserve against the contingency of having to remove our works in case we are not able to renew our lease on satisfactory terms, and as we have provided £23,000, we have now only to provide £7,000 in the next nine years, or about £800 each year. Taxation is increased by £3,329. The net result is that, adding the balance brought from last year of £10,602, we have a credit to the profit and loss account of £28,221. While there has been general expansion in orders during the past twelve months, the year's profits have not risen correspondingly owing to unavoidable expenses to which we have been put to meet A.R.P. requirements; and, furthermore, by reason of the incidence of taxation. Your Board decided to pay the dividend at the rate of 7½% on the preference shares, less income-tax, for the past year. And after careful consideration your Directors recommend for your approval the payment of a dividend of 10% and a bonus of 6d. per share on the ordinary shares, less income-tax, for the past year.

Although we have been carrying out several important orders as sub-contractors for Government work, we have secured several large and important orders for gas plant, and there is every indication that further contracts will follow as time goes on. I have no doubt that we will be successful in maintaining our connexion with the Gas Industry. This latter course would always be our continued aim as being essential to the prosperity and goodwill of our Company when we return to normal times.

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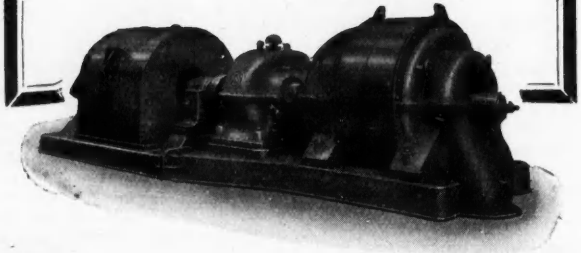

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